consulting engineer

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Plant Site Selection

Compacting Sandy Subsoil

Passenger Conveyors

Electrical Modernization

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NYACE Builds Prestige

March 1954

Outstanding Projects

OTTO F. SIEDER has some views about conducting an engineering business that are modestly plain. But they have carried him into the president's chair at H. K. Ferguson Company regardless of their homely straightforwardness. He thinks hard work and close application to duty are the fastest

—Continued on page 6

The Consulting Engineer's Professional Magazine

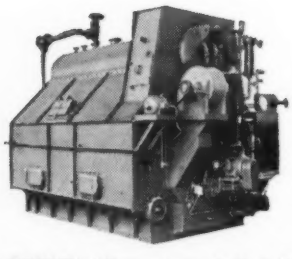
100th ANNIVERSARY WICKES BOILERS 1854-1954

Early photograph of Wickes' shop force

The year was 1854. Franklin Pierce was President. Stephen A. Douglas was leading a fight to abolish the Missouri Compromise on slavery. The railroads were beginning their first westward expansion . . . just the year before, rail connection had been established between New York and Chicago. Only 10 years before, Samuel F. B. Morse had invented the telegraph, and new inventions were rapidly changing the face of American industry. Large scale production was at hand, and industry stood on the threshold of a new, remarkable era.

Though the first Wickes Boilers would look crude indeed alongside the highly efficient units Wickes makes today, they were quite advanced for their time, and industry soon learned that the name Wickes stood for dependable low-cost steam production. Through constant research, expansion of manufacturing facilities and the introduction of modern production techniques, Wickes has maintained that position of leadership for the last 100 years.

Today, Wickes can supply your requirements for steam generators capable of producing 500,000 lbs. steam per hour at pressures up to 1000 psi. — all types of multiple drum boilers adaptable to any standard method of firing. For pressures up to 900 psi., with sustained steam production up to 40,000 lbs., Wickes Type A Boilers can be shop-assembled, ready for immediate installation. Consult your nearest Wickes representative or write today for descriptive literature.



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MARCH 1954

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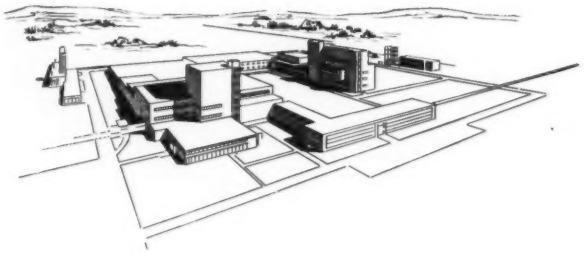
Outstanding Projects

—*Starts on front cover*

roads to success. He thinks temperate habits and moderation lead to a long and happy life. He thinks you should be just in dealings with your employees and that you should be fair in demanding results. Sieder thinks that regardless of effort or cost involved, contract obligations and promises made to clients should be carried out.

Such policies have brought Sieder, and Ferguson, an impressive string of jobs: Procter and Gamble's "Tide" plants across the country; Ford Motor's Windsor, Ont., power plant; Chrysler's tank plant at Newark, Delaware; Pittsburgh's Mellon Square garage; Corning Glass' Parkersburg, W. Va., mixing plant; and there are many more.

Sieder worked on the design of New York's famous Flatiron Building early in his career. He went to South America in 1908 to build some of the first tall buildings there. He returned to the United States and became chief engineer and vice president of Levering and Garrigues; here he designed some of the largest skyscrapers on Manhattan, including Wall Street's Bank of Manhattan building. Early in World War II, the Army Corps of Engineers asked for his services. For them he supervised design and construction of $4 billion worth of projects as head of the Industrial Construction Division.



Ferguson got Sieder in 1945 as its manager. Later, as executive vice president and general manager, he had over-all charge of every job in the house. Holding down such a job has three major facets, as he sees it. The prime responsibility is to select proper engineering personnel to meet the requirements of any large undertaking. Next is to be sure that the personnel are organized so that all features of engineering and construction are properly coordinated to obtain the highest efficiency. Finally, supervise each and every project personally to make sure the work is going according to plan.

Personal Attention

This personal attention to every project is a working principle with Sieder. Consequently, he plays a prominent part in many of the firm's outstanding achievements. Corn Products' "Bluebonnet" plant at Corpus Christi, Tex., is an example. This job pioneered "open" construction. The plant was judged one of the most outstanding projects of architectural design since World War II, by the New York Museum of Modern Art.

He also had a very direct hand in the design of Courtalds' viscose rayon plant near Mobile, Ala. By redesigning the process, the area required was cut to half that normally needed for equivalent capacity. The plan shows an integrated approach to design, procurement, and construction.

Cuts Floor Area

The operation being almost fully automatic permitted certain parts to be in open construction; this greatly reduced air conditioning costs. The process equipment was increased in unit size, thereby cutting total floor area in half by eliminating most of the room ordinarily needed for transfer and handling the cellulose in various process stages. The plant will also accommodate future expansion and process changes admirably. Such is the Sieder personal touch.

Among current projects are Imperial Chemical's "Terylene" plant at Kingston, Ont., Hooker Electro-chemical's chlorine-caustic soda plant at Montague, Mich., Titanium Metals' plant at Henderson, Nev., and the huge Westgate Shopping Center near Cleveland. Sieder is in personal touch with each of these jobs, making sure that Ferguson fulfills its clients' wishes.

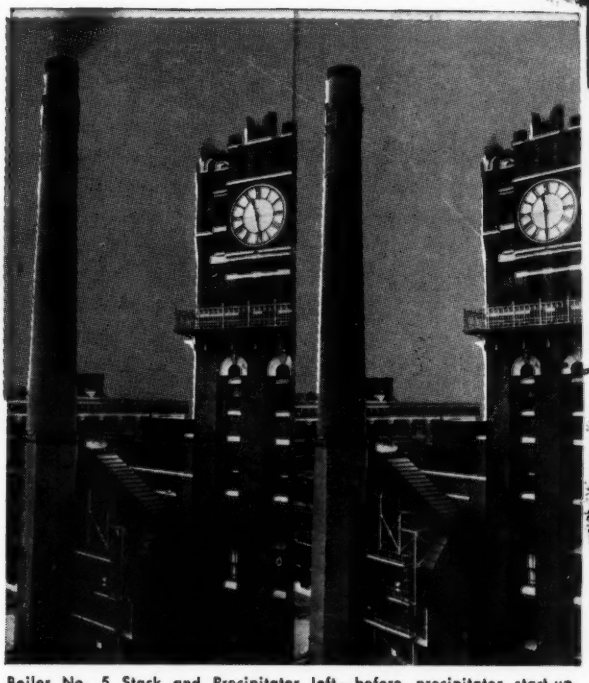
Part of his stock-in-trade is a pre-planning system for detailed study of projects in the very early stages of their development. Sieder calls it the "organized application of common sense." Jobs such as the Courtalds rayon plant show that his early thinking pays off for Ferguson and for the client.

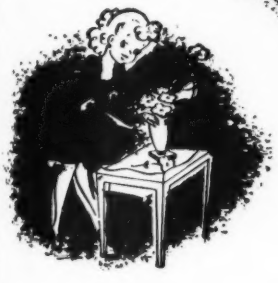
Ten Hour Day

When he's in one place long enough, ten hours at his desk makes up a work day for Sieder. Add to this the work taken home to Shaker Heights, and you recall his views relating application to duty and success. Nonetheless, Sieder finds time within his busy schedule to pull off a respectable golf game.

He is now a long way from the beginnings of a career marked with work on urban skyscrapers. Otto Sieder is now well known for those long, low, modern industrial buildings dotting the countrysides. His career indeed mirrors the trends to which he has contributed. ▲▲

Less dust for St. Louis housewives...





Boiler No. 5 Stack and Precipitator left—before precipitator start-up right—precipitator in operation [boiler load 200,000#/hr.]

Anheuser-Busch leads the way with AEROTEC Electrical Precipitators

The brewers of famous Budweiser Beer know the importance and value of good public relations. Not content with just meeting local requirements for dust control, the Company sets the pace for air-pollution control in St. Louis.

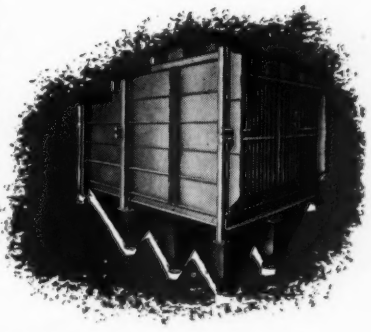
Together with an existing mechanical collector, the first of five Aerotec Electrical Precipitators at Anheuser-Busch *is collecting 2000 lbs. of dust every 60 minutes from a single stack.*

The remaining four electrical precipitators are about to be placed in service, and dust emission will be less than one fourth of the maximum allowable under the requirements of St. Louis' dust ordinance.

Reasons for Aerotec's higher collecting efficiency are:

- Pocket-type collecting electrodes prevent precipitated dust from re-entering gas stream.
- Exclusive flat high voltage plate presents a field of uniform maximum intensity for most effective precipitation.

For other advantages of Aerotec Electrical Precipitators write or call our project engineers—Thermix Corporation.



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SCRAPS & SHAVINGS

EVERYONE in the country with the slightest interest in the subject now knows that Radio Corporation of America has made an atomic battery which works. We also know that David Sarnoff, President of RCA, sat down at a small telegraph semaphore, and using his old skill as a telegraph operator along with the modicum of power from the atomic battery, sent some message to somewhere. This demonstration of a low-powered battery was handled with considerable dexterity by a very high-powered battery of publicity men. The AP was there; the UP was there; *Time* and *Newsweek* were there, along with a lot of first class cameramen and all the usual trimmings.

One of the persons not at that press conference was Mr. Philip E. Ohmart, President of Ohmart Corporation, Cincinnati, Ohio. Mr. Ohmart is not so well known to the general public as Mr. Sarnoff, but it happens that it was Mr. Ohmart who made the basic discovery of the principle of the atomic battery, and it was the Ohmart Corporation that delivered working cells to Wright Development Center back in July, 1953.

To us the fascinating aspect of this story is not who was first and who was second, but how the publicity men went about their job. RCA hit practically every paper in the country with a long news story. The stories were repeated at length in both of the big weekly news magazines. Everybody now knows about RCA's great development.

Meanwhile, what had Mr. Ohmart been doing? Had he been furtively hiding his discovery? Far from it. He and his publicity people had been working hard to tell the public about his atomic battery. There was a story in the *Cincinnati Enquirer* in October 1951. He published a paper in the *Journal of Applied Physics,* in December 1951. In that same month there was a story in *Business Week, Aviation Week,* and *Chemical Processing. Popular Science* described his atomic battery in August 1952, and the *Wall Street Journal* wrote about it in April of last year. With all of this work it would seem that certainly somebody with RCA, UP, AP, *Time,* or *Newsweek* would have heard of Mr. Ohmart.

Within a week after the RCA announcement, Ohmart Corporation girded its loins and sent out a couple of news releases attempting to get back into the act. They were just about as effective newswise as would have been a prediction of light showers a week after the Biblical flood.

Mr. Ohmart missed the boat but right. And we can hardly blame him. Sarnoff probably spent about as much on that one press announcement as Ohmart spent in the development of his atomic battery. Furthermore, there is not too much of a chance for the smaller company to get its story over in one great splash the way RCA did. Newspapers run into "inventors" every day who want to tell about their "perpetual motion" machines or "atomic" potato peelers, but when RCA says so, that's different.

In any event, we want to congratulate Mr. Ohmart on his atomic battery and Mr. Sarnoff on his publicity department.

THE SOUTH CAROLINA State Highway Department placed an advertisement on September 24, 1953, for competitive bids on the engineering work required in connection with the building of a bridge along the Intercoastal Waterway. Fifteen sealed bids were received, including some from firms whose principals are members of the American Society of Civil Engineers.

Competitive bidding is absolutely forbidden by the Code of Ethics of ASCE, so here has arisen a specific example of members breaking the code established by their own technical society.

The case was fully considered by the ASCE Committee on Professional Conduct, and by the Board of Direction, at its recent meeting in Atlanta. The Board directed the Executive Secretary to write to the members involved, asking each to explain his actions.

Presumably, these letters have been sent out, and now those members may take either of two courses. They can explain their actions, or they can ignore the whole affair. The Society will then be faced with a problem, which does not seem to have been fully solved in Atlanta. Should the whole matter be dropped once explanations have been made; should the members involved be reprimanded in grave tones; or should all involved be summarily thrown out of the Society?

It will be interesting to see what action is taken. Rarely have engineering organizations taken any serious action against code offenders. Today, however, there is a rising consciousness of the importance of ethics in professional engineering, and this may be great enough to force formal action.

It was right for the Board of Direction to act slowly in this matter. It should be thoroughly investigated before any action of a punitive nature is taken. On the other hand, the Board of Direction of ASCE can be sure that their actions will be noted by all professional engineers, and those actions will have far-reaching effects upon ethical conduct.

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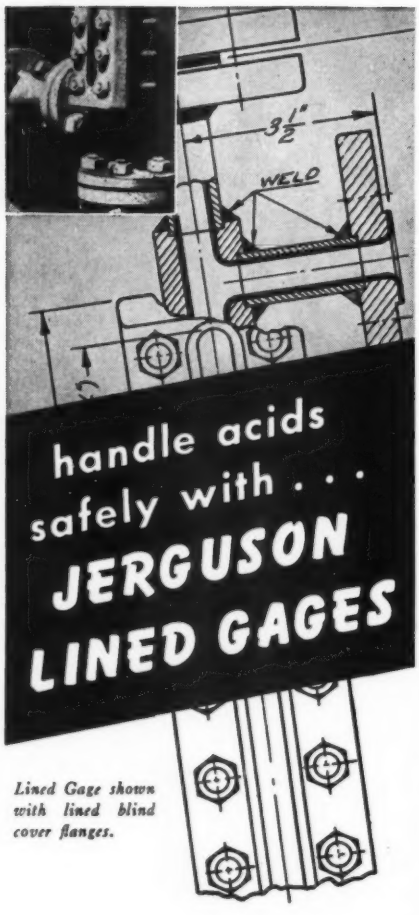

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READERS' COMMENT

ASHVE for Engineering Center

Sir:

The American Society of Heating & Ventilating Engineers, on recommendation of its Long Range Planning Committee, of which I am a member, has expressed its intention to join with other engineering societies in the plan to set up an engineering center, two proposals for which were admirably described in CONSULTING ENGINEER in January and February of this year.

I feel that the members of the Long Range Planning Committee of ASHVE should have copies of your excellent articles. To provide them, I should like permission to make a half dozen photostatic copies of those articles. I hope you will grant me this permission.

J. Donald Kroeker
J. Donald Kroeker and Associates
Portland 4, Oregon

Professional Consciousness

Sir:

I have become a regular reader of the CONSULTING ENGINEER, and I want to compliment you on the splendid start you have made toward developing a most worthwhile publication.

Your statement that your publication is "the consulting engineer's professional magazine" leads me to comment that I believe the welfare of the profession would be well served if you would publish articles written to stimulate the professional consciousness of your readers. As an example of my thinking I inclose a copy of the December 1953, issue of *The Slide Rule*, the monthly publication of the Houston Engineers Club, in which you will find reproduced the text of a talk delivered by me on October 15, before the Travis Chapter of the Texas Society of Professional Engineers at Austin, Texas.

It is my feeling that the men in the consulting field must stimulate this professional consciousness if the engineering profession as a whole is ever to receive the recognition it deserves because of its service to mankind.

As you will probably surmise after reading my talk, I am quite active in the affairs of the Texas Society of Professional Engineers, presently serving as a Director of the State Society and as Chairman of its Committee on Registration Enforcement. I hope that you will continue to provide space in your columns to advance the idea that "engineering is a profession."

J. B. Dannenbaum
Consulting Engineer
Houston 2, Texas

Engineers' Unions

Sir:

We have read Cliff Shumakers' article in the January issue of CONSULTING ENGINEER and find it a most enlightening exposition. In fact, if it is possible, we would like to have some reprints or permission to reproduce it—or both. If I had some reprints we could circulate them at a joint meeting of ASME and NSPE here on February 25th at which T. A. Marshall, Jr. is to speak.

I have personally followed this problem of the possibility of an Engineer's Union for many years. I believe "Collective Bargaining" for engineers would be a most pathetic situation for our national economy as well as a negative influence toward professional development for us as engineers. For this reason primarily I have devoted most of my spare time to professional engineering society activities.

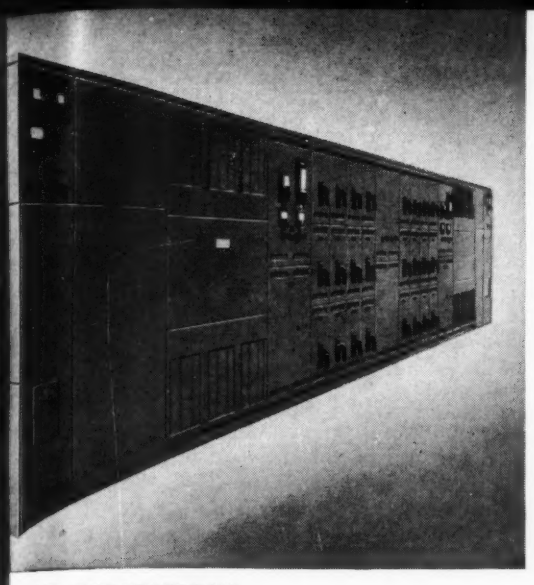
It is my opinion that this article should find its way into the hands of every management and engineering person in the United States, if this were possible.

Art Heiberg, Chairman
Akron Section, ASME

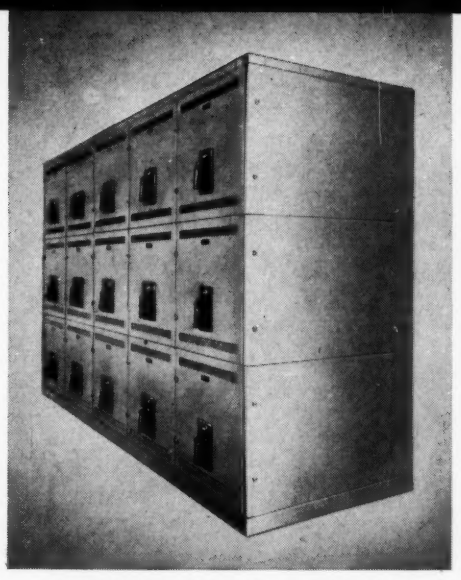
With Interest

Sir:

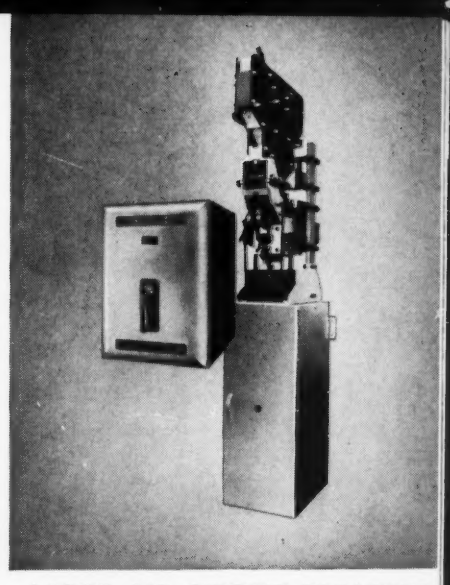
I have read a number of issues of your magazine with great interest and would like to request that



UNIT SUBSTATIONS



LOW-VOLTAGE SWITCHGEAR



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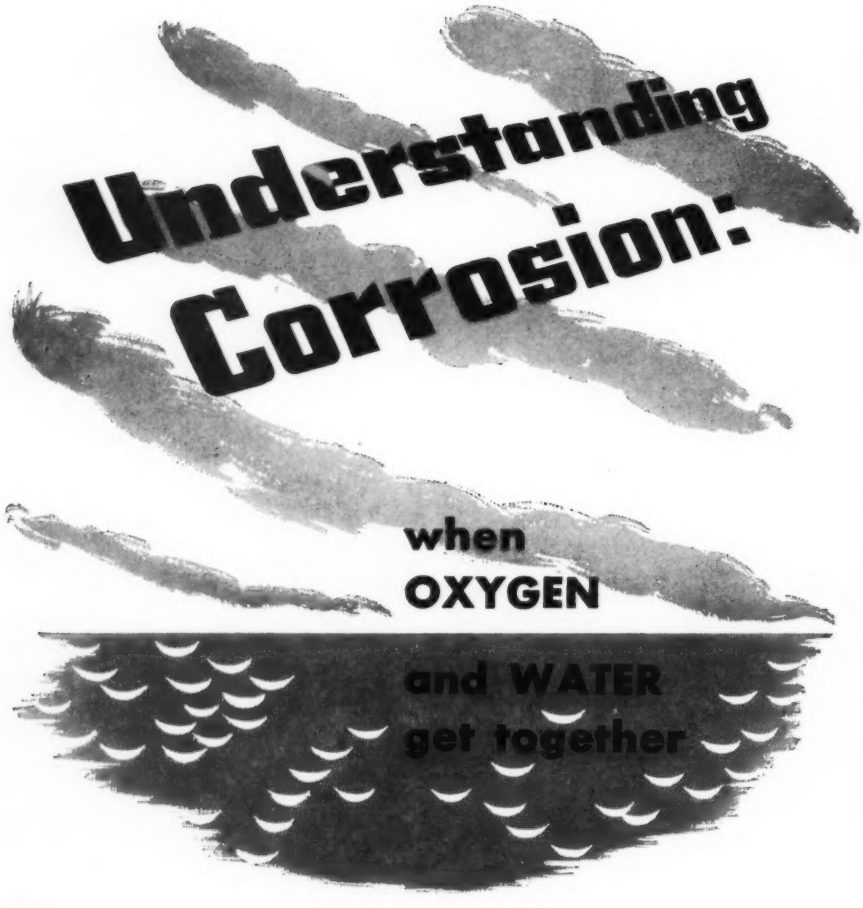

When free oxygen combines with atmospheric moisture or natural waters, the stage is well set for corrosive action. Controlling the degree and extent of that action are many related factors, variable in influence under differing circumstances.

The rate at which oxygen is transferred from atmosphere to a solution is, for example, directly proportional to the amount of exposed surface area of that solution, while the corrosion rate of immersed metal is, in turn, proportional to the oxygen concentration of the solution. Therefore, with all other factors stabilized, a reduction in exposed surface area will slow the oxygen-solution process, thereby greatly retarding corrosion.

How deeply metal is immersed, particularly in a quiet solution, is another determinant of corrosive action in which dissolved oxygen is the governing factor. Oxygen saturation, highest at and near the surface, diminishes with increasing depth as convection currents become less active. Corrosion at and immediately below the surface of a liquid is therefore far more severe than that encountered at greater depths.

These and other variables that combine to produce a given corrosion problem must be evaluated in any attempt to reach an effective and practical solution. Such evaluation, based on thirty-five years' corrosion-control experience, is standard Dampney procedure. That is why your specification of a Dampney Coating assures you so much *more* — protection you can depend upon to meet not only standard industrial service requirements but your specific equipment-operating needs. For data on Dampney Protective Coatings and their place in your corrosion-control program, write

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you add my name to your mailing list. I would especially appreciate receiving two copies of the February, 1954 issue of CONSULTING ENGINEER.

Seymour Baron
Burns and Roe, Inc.
New York 7, New York

Coal and Steel Consultants?

Sir:

We are interested in the possible services of specialized Consulting Engineers in the Coal and Steel industries. The firm (or individual) we are seeking would be acquainted with the industry, with corporate structure of producing companies, and have a first hand knowledge of products.

Perhaps you can offer suggestions along the lines noted. Such assistance as you can offer will be gratefully received.

Incidentally, the writer (whose services are utilized as a general consultant) receives CONSULTING ENGINEER regularly and in turn circulates it through our executive group. The format is excellent and editorial content improves constantly. Keep up the good work.

R. E. Reed
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New York 4, New York

● QUALIFIED CONSULTANTS SHOULD CONTACT MR. REED.—ED.

Structural Design

Sir:

May I have tear out sheets "Economy in Structural Design" by Paul Rogers, pages 32-35 of CONSULTING ENGINEER, January 1954 issue.

E. M. Laskey
Director of Engineering
H. P. Hood & Sons
Boston 29, Massachusetts

Sir:

We would appreciate very much your sending to us a tear sheet or reprint of the following article which begins on page 32 of the January 1954 issue of CONSULTING ENGINEER, "Economy in Structural Design", by Paul Rogers.

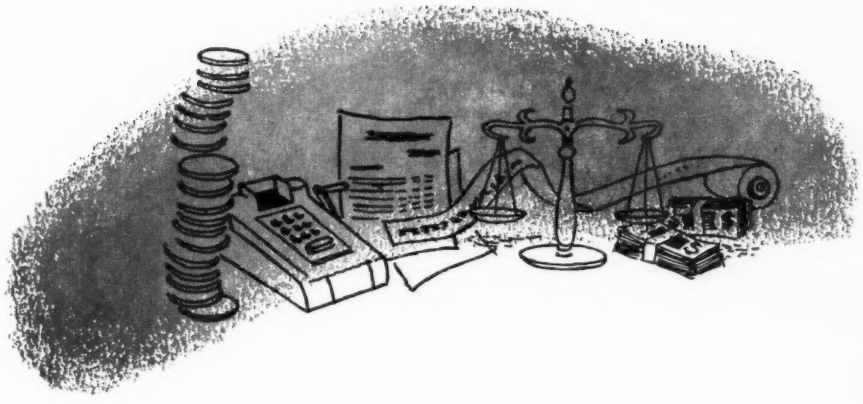
Helga Front, Librarian
J. F. Pritchard & Company
Kansas City, Missouri

Sir:

Will you please send tear sheets of the article "Economy in Structural Design" beginning on page 32 of the January, 1954 issue of CONSULTING ENGINEER.

Duncan J. McNeil
Civil Engineer
Los Angeles 26, California

ECONOMIC NEWS NOTES

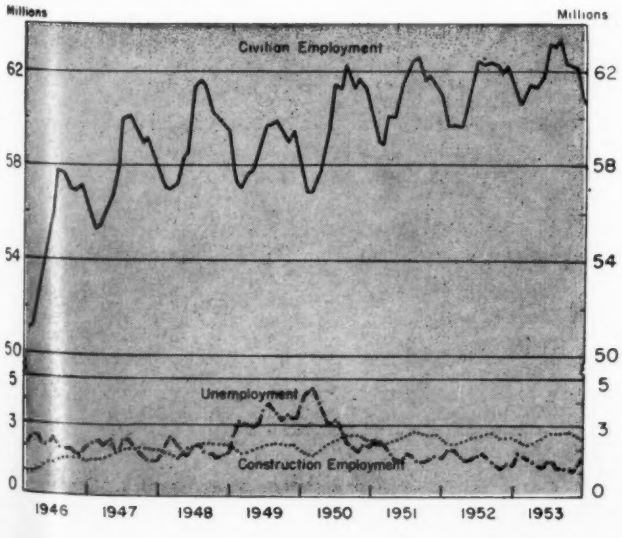


E. F. Mac Donald
INDUSTRIAL ECONOMIST

WORDS OF WARNING—State and local governments are being pointed out as the new and all-powerful source of spending to offset declines in Federal outlays and serve as a major prop for the economy. It's true that we can hardly exaggerate the capital project needs of states and municipalities, but there are practical limitations on such spending. These were stated by experts appearing in February before the Joint Congressional Committee on the Economic Report. For example: "There is not a state, city, or municipal subdivision which can, on its own, finance a depression construction program sufficient to make a real dent in the employment problem." (Mr. R. Moses, New York City)

TIGHTER MARKET—Job opportunities in January were 35% under a year ago. A survey of ads in newspapers in 114 cities also disclosed New York bucking the trend in an apparent attempt of business firms to raise the quality of their personnel. The survey indicated that although the labor market has eased considerably, engineers and industrial specialists are still in short supply—at current salary levels.

MONTH OF DECISION — At mid-February the President put the finger on March as the key month in the employment picture. He indicated that unless employment rose seasonally, it would be regarded as a signal of trouble ahead. At the time he made this statement, initial claims for unemployment insurance (see chart) were about 88% above a year earlier. By the time you read this, March employment data will be in the process of collection, and the President will soon have important, but not conclusive, evidence of the direction in which the economy is headed.



NO RESERVE—An escape clause in the provisions dealing with the machine tool defense reserve permitting Government-owned tools and equipment to be leased for non-defense production is severely criticized by the National Machine Tool Builders Assoc. It argues that "widespread leasing of defense machines for civilian purposes" would prevent the establishment of an adequate supply of machine tools immediately available for military production—the very purpose of the machine tool defense reserve.

GROWING BACKLOGS — 70% more municipalities report increasing backlogs of engineering plans than those acknowledging declining volumes. In a recent survey of capital improvement plans for 1954-58, conducted for the President's Council of Economic Advisers, 175 municipalities broke down their backlogs by size of growth in the following order: streets and roads; sewers, water, and other utilities; schools; and general municipal buildings. It was disclosed that only a relatively small part of the expected total capital outlays is represented at present by detailed engineering plans and specifications.

THEORY VS PRACTICE—Just a couple of months ago the difference of opinion was sharply defined. The Administration held that if the economy needed to be stimulated, to counter a recession, the best way was through the field of production — tax measures, for example, helpful to business. "If there is to be expanding private employment, there must be employers" seemed to be the basic idea. Dissenters argued that encouragement and aid should be given mainly to consumption. To them, the "standard of living (consumption) is the fulcrum on which the delicate balance of the American economy rests." Actually, as the President indicated recently, if a depression threatens, Government aid to both production and consumption would be given and with no likely distinction of priority.

TAX REVISION—In the first full-scale overhaul of the Internal Revenue Code since 1939, the House Ways and Means Committee has included provisions of considerable advantage to business. Relief is proposed for double taxation of dividends. Tax law on corporate capitalization, liquidation, and reorganization is simplified and liberalized. Depreciation allowances are liberalized, and loss carrybacks raised from one to two years. Also, the rate on income earned on foreign operations has been reduced, rules regarding improper accumulation of surplus earnings are eased—as are restrictions on the tax-exempt status of pension and profit-sharing plans —and research and development costs may be written off in one year or amortized over 5 or more years.

ATOMS IN ACTION

DIVING INTO the nuclear reactor business is Babcock & Wilcox' Atomic Division. Within a week of the announcement by the University of Utah that it was going to build an atomic-powered locomotive, B & W's engineers had the reactor on their design boards. The reactor will use fluid fuel. The principal problems seen by C. H. Gay, boss of the B & W division, are arranging for adequate heat exchange between the fuel and pressurized water, beating corrosion, and holding down neutron damage. The most complicating factor is the limited space available.

EVER WONDER how those electromagnetic pumps work? A patent just released for public use describes one such pump for moving electromagnetic liquids. The liquid is whirled in the pump chamber by the action of a rotating magnetic field straddling the pump; the liquid is forced out through peripheral holes in the pump chamber by centrifugal action.

DUMPING ATOMIC wastes will become increasingly difficult as the amounts involved increase and the available dumping grounds are filled. The problem was discussed recently at the ASCE National Convention, in Atlanta. Joseph A. Lieberman and Arthur E. Gorman of the AEC's Sanitary Engineers' Division said, "The long half life of certain radioactive materials makes it essential that the effect and probably ultimate fate of wastes . . . be carefully appraised before they are released in any significant quantities into the ground, air, surface waterways, or sea. The importance of this time factor constitutes a significant difference between wastes of atomic energy and most other industries."

TWENTY PERCENT of the 25,000 engineers expected to graduate in 1956 will be hired by the AEC, private atomic industry, and atomic activities of the armed forces. And L. E. Johnston, manager of the AEC's Idaho Operations Office, told the Idaho Society of Professional Engineers that they should consider adding nuclear engineering to those fields in which they grant registration.

RADIATION PRODUCES gaseous breakdown products, ruptured polymer chains, cross linkages, and double bonds in plastics molecules, according to J. W. Ryan, of GE's General Engineering Laboratory. Apparently the already versatile polyethelene will find still another use as a container material for drugs being sterilized by radiation; polyethelene undergoes extensive chemical reactions while being irradiated but maintains its mechanical strength and improves in temperature resistance.

WE'RE PAYING $150 million during the fiscal year ending next June 30 to develop improved reactors for industrial and propulsion power, according to the AEC's Annual Report for 1953. The AEC's decision to build large-scale power reactors follows from industry's demonstrated unwillingness to sink large sums of money into such work at this time.

Here's Why the Chemical Industry is Interested in Plant Sites Along the C&EI

***"Industrial Fore-Site" directs the Chemical Industry to examine communities served by the Chicago & Eastern Illinois Railroad . . . to find new profit opportunities for plants pointed up by the economic advantages of this Indiana-Illinois area.**

POWER

Private public utilities with millions of kilowatts capacity offer industrial power at attractive rates. Generating stations under construction will augment the supply of efficiently produced, low-cost power.

LABOR

A large, native-born, experienced labor force is available. Harmonious labor-management relations in most manufacturing plants insure smooth, uninterrupted operation of facilities.

FUEL

Coal produced in this leading mining region and oil from its wells or pipelines are economical fuels and possible chemical raw materials. Major natural gas and petroleum products pipelines traverse the area providing bulk supplies of refined fuels and the basis for chemical processing.

WATER

The Ohio, Mississippi, and Wabash Rivers have virtually unlimited water for industrial purposes. Strategic, river-side sites are available.

MINERAL RESOURCES

Abundant high-calcium limestones, fluorspar, dolomite, zinc ores, clays, sand, silica and other local mineral deposits greatly expand the area's chemical processing potentialities.

TRANSPORTATION

Situated in the Nation's leading industrial and agricultural market area, this Indiana-Illinois region is served by 20 major railroads with all modern facilities. Barge lines and river-rail transfers provide direct water access to domestic and foreign raw materials. A network of highways furnishes routes for many motor transport carriers.

***"Industrial Fore-Site"** is a shrewd management quality that gets the jump on competition by choosing plant sites with superior economic advantages.

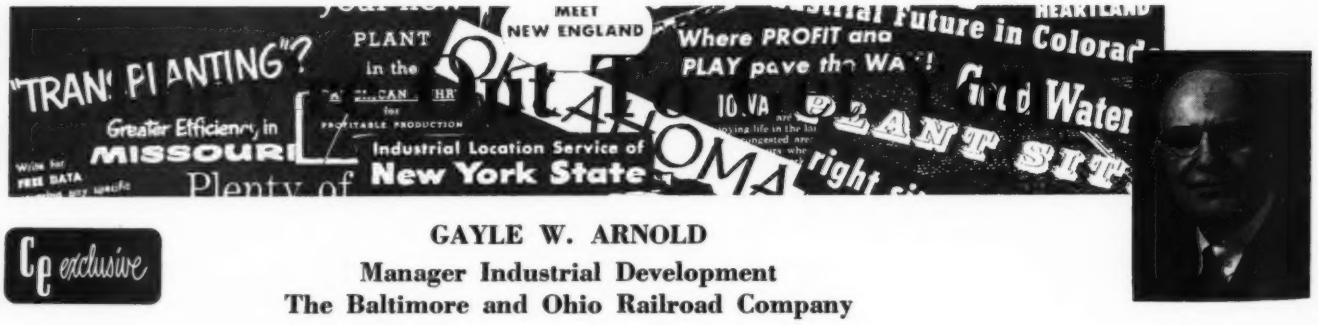
For factual information on these outstanding industrial opportunities in this Indiana-Illinois area, write in confidence to Chief Economist:

C&EI

CHICAGO & EASTERN ILLINOIS RAILROAD

332 SOUTH MICHIGAN AVENUE, CHICAGO 4, ILLINOIS

WATER, ELECTRICITY, AND RAIL TRANSPORTATION MAKE THIS AN ATTRACTIVE SITE FOR AN INDUSTRIAL PLANT.



Cp exclusive

GAYLE W. ARNOLD
Manager Industrial Development
The Baltimore and Ohio Railroad Company

THE CONSULTING engineer sometimes feels that in making plant location surveys his staff is alone, with no "outside" aid. Understandably, he may be reluctant to disclose his client's situation, requirements, and plans to any individuals outside his own organization.

True, he goes regularly to his physician for a checkup; he consults his legal advisors on problems which in his judgment are open to question. But when the future of his client's production, sales, and profits is affected by his decisions he is reluctant to call in the specialists, to discuss frankly his "symptoms", and to at least secure advice, whether followed or discarded. Why? The answer is found under several heads: fear of premature and damaging publicity; fear of a leak to competitive elements in industry; and fear of a "sales effort" onslaught by communities, utilities, railroads — or even other engineering firms.

The head of an industrial firm known in every civilized nation in the world deemed it advisable a while back to advise his staff officers against the use of any outside assistance whatever in plant location investigations. The reason for this reputedly had its start in a leak originating in an organization with whom the company had discussed a plant location problem. However, that lone-wolf experiment was not successful, since today the staff of that organization freely discuss their problems with engineering firms, railroad development men, state and local development agencies, and others interested. Too, their public relations have been benefited because the communities feel they are part of the company's activities; even when unsuccessful, they feel they at least had a fair chance.

> Area development groups are out to get you and your clients to locate within their domains. Shopping for a plant site in behalf of clients can be quite a chore in the face of these pressures.

Over a period of many years many of the nation's larger industries have permitted — have even requested — their consulting engineers to work with the railroad development man, to use him wherever he might be helpful.

First of all, the railroad development man is an impermeable screen behind which the identities of the industry and their engineers can be concealed. A railroad development officer worthy of the title really knows the cities, towns, and country-side along the route of his road. Generally, he is well known to the governor of the state, the mayors, the road commissioners, the tax authorities, the zoning officials, and the many others in a state and municipal government whose good will can influence, favorably or otherwise, the attitude of the state or the community toward the industry.

Widen Contacts

The engineering consultant could foreseeably develop and cultivate similar contacts, but only after a period of years. Conversely, the railroad development officer, who "lives there every day," can pave the way, assure an audience, and when desired, mask the identity of even the engineering firm involved. (It is often not enough to keep the name of the industry out of it.)

Suppose a representative of a large consultant visits a state or municipal official, asking questions. Instantly he would be associated with one of three or four of his biggest clients. One of the nation's largest chemical corporations almost lost a prime site for a huge plant because their representative registered in the local hotel from his own home town and state.

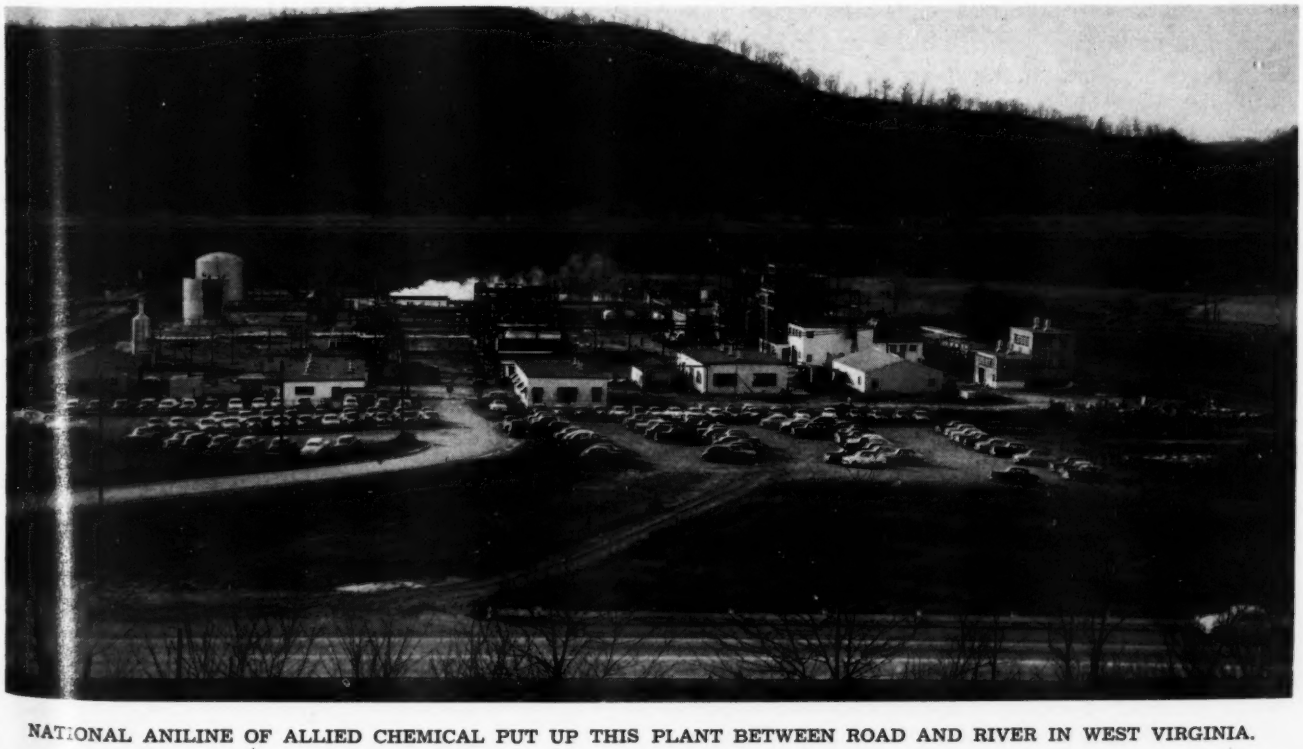
State and local government officers know the railroad; they know it as a taxpayer — and a big one. They personally know what manner of man represents the development activities of the railroad. Doors are open to the railroad development man, but they need not know whom he represents.

In a state served by one of the East's leading railroads, it recently became necessary to bring about the construction of a long gap in an otherwise excellent highway system. The gap happened to be the only means of access to a particularly desirable large industrial site. Because of the railroad's intimate acquaintance with the governor and other officers involved, because of the railroad's importance in the state, because the railroad had successfully influenced the location of new plants representing an investment of several hundred million dollars (consequently broadening the tax base), the plea for bridging the highway gap was given the consideration it deserved. The road is well along toward completion.

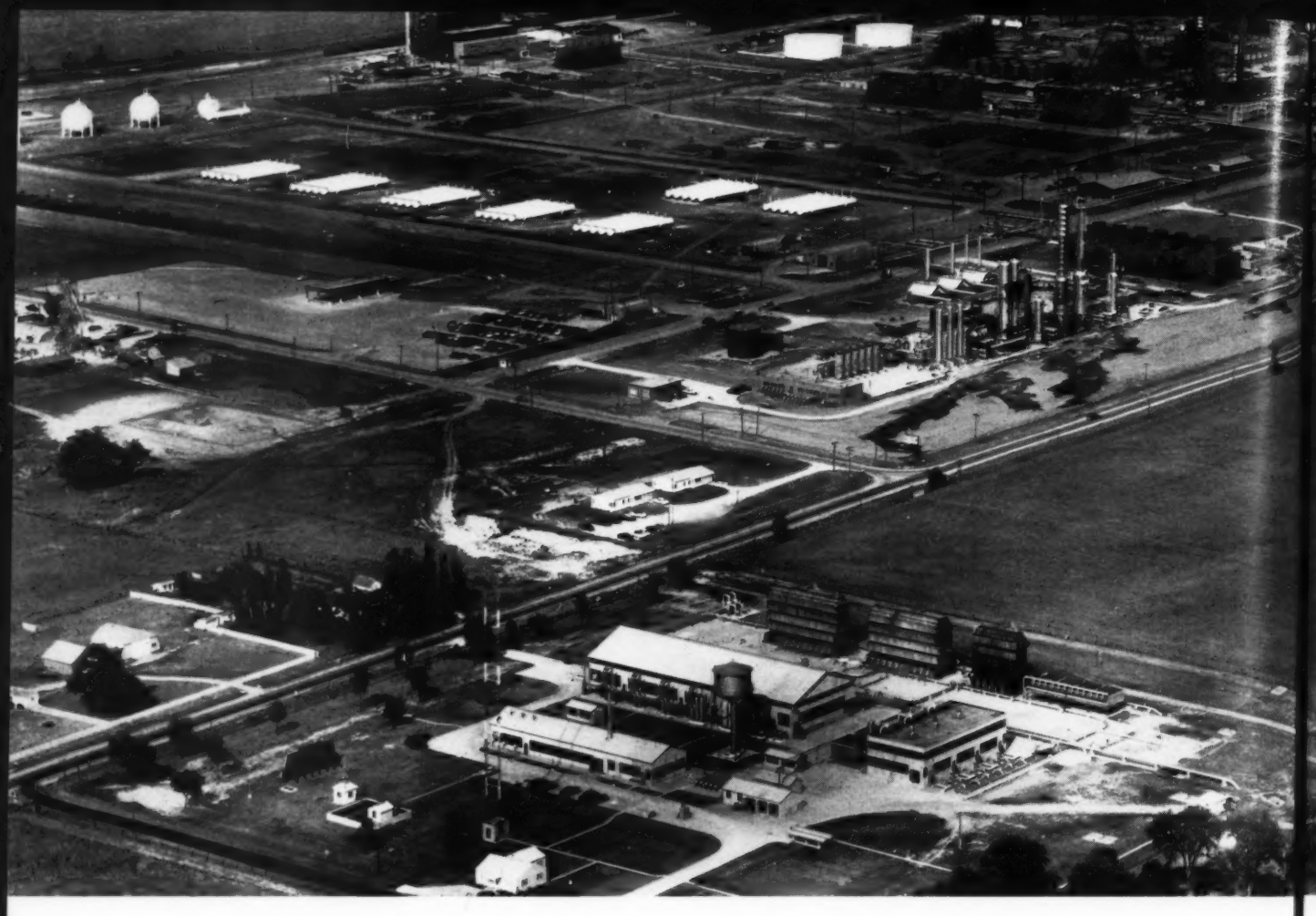
Engineer's Plea

Now, suppose an industry or the engineering firm representing it would go to the governor and the state road commission with the same plea. Knowing how such matters are handled, would the result have been the same?

While some of the better-known engineering firms understand and literally make free use of railroad development men — often to the point of consider-



NATIONAL ANILINE OF ALLIED CHEMICAL PUT UP THIS PLANT BETWEEN ROAD AND RIVER IN WEST VIRGINIA.



ing them staff members in everything but payroll — there are still those who look askance at the railroad development officer because they don't know him or his methods. That attitude is understandable unless and until it is found that the railroad and the man who represents it can be treated as a member of the family, open to frank and free discussion of confidential matters, and entitled to faith and trust.

State and local government officers want payrolls; they want a broadened tax base; they want obsolete industrial facilities razed and plants moved out to the perimeter; they want playgrounds to take the place of multi-storied factory buildings. Communities, too, are aware they can't solve their problems by themselves.

Experts Cite Zoning

In response to an urgent appeal, one organization —the Urban Land Institute—recently sent an industrial council of 19 high-salaried executives from industry, finance, insurance, real estate, railroads, engineering firms, and related companies to the West Coast for a week's seminar with the county and municipal officers of a community near a large city. For a week, from early morning to late night, the panel sat around the table with the local officials. Why? That they might solve a rather desperate tax situation. How? By so simple a thing as recommending changes in zoning to permit the location of industries suitable to the community involved.

Simple, you say. Yes; but not until the group of "experts" — who served without pay and paid their own expenses — brought to bear on the problem their combined education, experience, and sagacity. This talent otherwise would not have been available, however high the fee.

Community Viewpoint

What has that incident to do with this discussion? Let's quote from the Urban Land Institute's Technical Bulletin No. 21, September, 1953, in a foreword by Executive Director Max S. Wehrly:

> To bridge the gap between mounting costs and taxpayer resistance to higher levies, many communities are soliciting new industrial plants to locate within their borders. The land, buildings, and equipment used by industry add appreciably to the tax base, while the additional demands for costly municipal services are relatively small as compared with an equivalent investment in residential property. Even more important, industries produce payrolls that generate more economic activity which, in turn, builds up tax revenues.
>
> The organized solicitation of new industries is by no means a novel idea. Many cities have been doing it for years, either directly or through business and civic organizations. Many states have well seasoned planning and development agencies. Railroads and public utility companies have new business departments with a keen eye for the industrial prospect.

THIS PLANT OF NATIONAL PETRO CHEMICAL BLENDS WITH THE COUNTRYSIDE AROUND FICKLIN, ILLINOIS.

Dealing in industrial property is an important aspect of the real estate business. Several national organizations are operating in this field. Altogether, these activities have built up a substantial body of knowledge, and there is rather extensive literature on the subject.

What is new is the awakened interest of many communities, particularly in the smaller population groups, that have hitherto been indifferent or even hostile to industrial development. These new entrants into the race are discovering that more is needed to attract industry than a welcome mat and a few tracts of vacant land; that industrial development is highly competitive; and that they urgently need to acquire knowledge in an art that, to them, is completely new.

Selection Factors

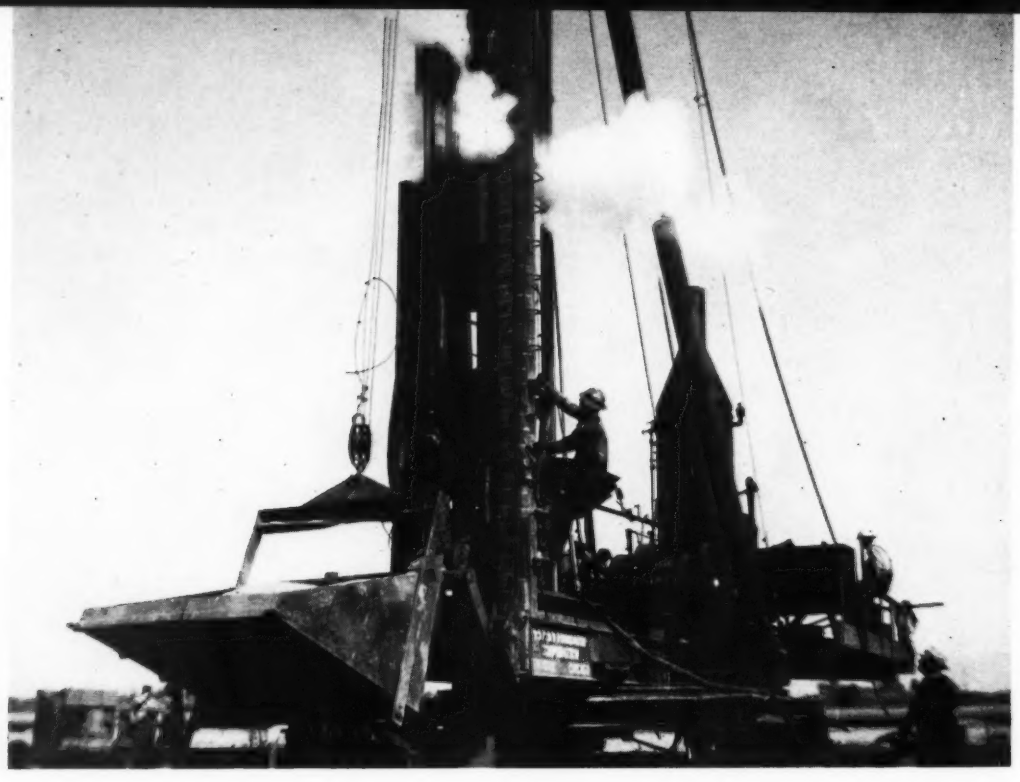
A financial writer on a New York paper headed a recent article: "Picking Factory Sites Highly Specialized Job". The same writer, referring to du Pont's new Dacron plant in Kinston, North Carolina, said du Pont reached a decision only after weighing 83 different factors and carefully studying 87 possible sites. Even then, no one community had the advantage in all factors. The final decision was a compromise, though Kinston rated highest on the more important factors.

In the Public Utilities Association of the Virginia's *Manual for Community Economic Development* it is recommended that in selecting a community for a prospective plant location 25 questions should be considered under the heading of natural resources; under industrial resources, 24 questions; under human resources, 18 questions; and under community services and facilities, 34 questions. The recommended questionnaire winds up with a section on ethical aspects, containing another dozen questions.

In a single year — 1953 — the industrial potential of the nation was increased by more than $28,000,000,000. And this was privately financed even though a third was certified as essential to national defense. That expenditure during 1953 for new plant and equipment — an all-time record — means that for the next 20 years, the gross national product necessarily will increase. Expenditures for new plant and equipment each year — barring a national emergency — must continue to climb. The railroads, aware of these potentials, are waiting and ready to help the engineer do his job. ▲▲

THIS HOTPOINT PLANT ON CHICAGO'S WEST SIDE GREW UNTIL IT OCCUPIED ALL THE AVAILABLE AREA.

THIS IS AN AMERICAN CAN COMPANY PLANT LOCATED SO THAT THE RAILROAD COMES RIGHT IN THE DOOR.



SKIP USED TO FILL THE PILES WITH SAND WAS LOADED WHILE RIG WAS DRIVING.

Compacting Sandy Subsoil

CE exclusive

WILLIAM F. SWIGER, Structural Engineer
Stone & Webster Engineering Corporation

ENGINEERS have known for many years that vibration could be used effectively as a means of compacting noncohesive soils such as sand or sand and gravel. The proceedings of the first International Conference on Soil Mechanics and Foundation Engineering, held in 1936, contained several papers referring to the use of vibration for this purpose. However, extension of this principle to natural deposits of loose sand within the United States has been rather limited—possibly because such deposits are not especially common.

Occasional instances of settlement of vibrating equipment have been noted in the technical press, and piles in sand sometimes encounter unexpectedly easy driving which can be attributed to an exceptionally loose deposit of noncohesive soils. In one instance, occurring in 1939, small charges of explosives were used to compact a stratum of fine loose sand underlying the site of the Franklin Falls Dam near Franklin, New Hampshire.

In 1947, the Southern Counties Gas Company and Southern California Gas Company built a major compressor station on the Texas Pipe Line near Blythe, California. The station consists of ten Clark Brothers reciprocating compressors.

Foundation studies made at that time showed the site to be underlain by about 13 feet of medium clay-silt, with medium to fine sands extending to an unknown depth.

The character of this clay-silt deposit was carefully investigated, and it was determined that the compressors could be founded in it at low soil

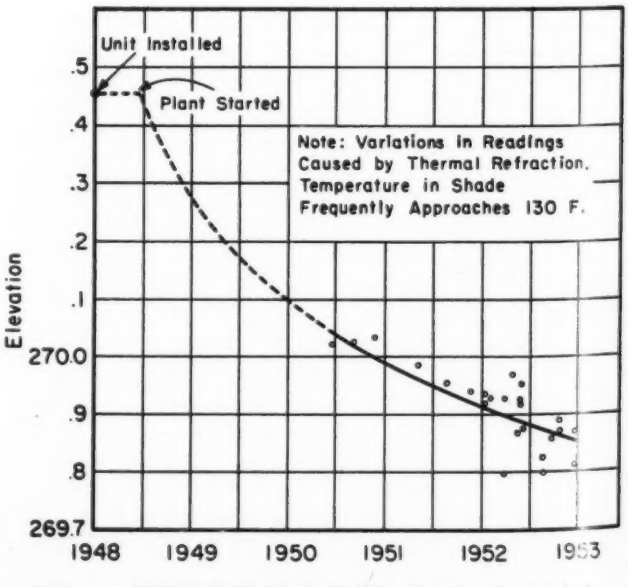


FIG. 1—SETTLEMENT RECORD FOR NO. 1 COMPRESSOR. SETTLEMENT IS TYPICAL FOR ALL UNITS.

bearing pressures by using a continuous mat. Unfortunately, specific measurements of the vibration of individual compressor units were not made, since these data were not considered of particular importance in solving the problem.

Settlement of Original Plant

Soon after the plant was placed in operation it became apparent that it was settling. Records kept since 1950 indicate that the settlement is continuing, although at a decreasing rate. By summer of 1953 there was about 8 to 10 inches total settlement.

Figure 1, showing the settlement record of compressor No. 1, is typical of the settlement of all the compressors. Because of the build up of vibration near the center of the compressor building, there has been somewhat greater settlement in the center than at the ends. Thus the structure shows a gradual bowl-shaped subsidence. Fortunately, this is not sharply differential and has not endangered the stability of the structure nor interfered with the operation of the compressor plant.

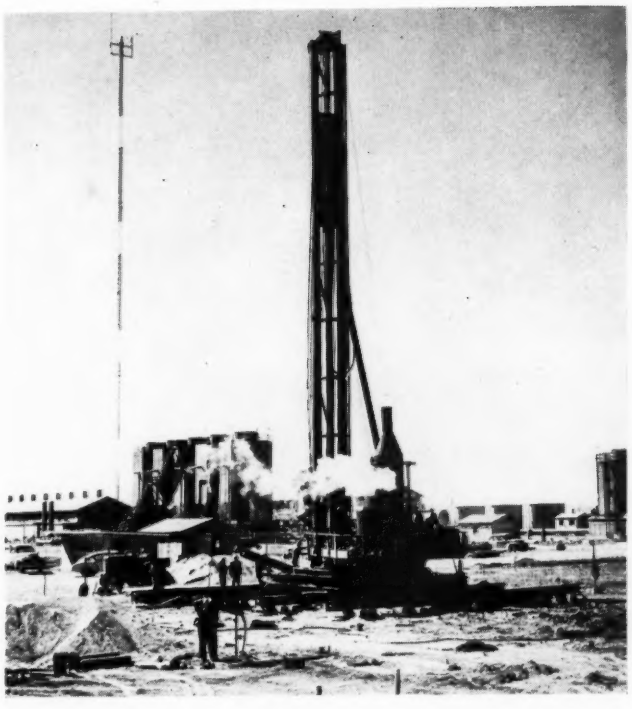
In 1952, plans for expanding the plant were developed. Two compressor units were to be installed, and provisions were to be made for future units as required. Although the settlement of the existing plant has not caused distress, it has been a source of concern. Accordingly, a thorough investigation was undertaken to establish the basic cause of the settlement and to determine what provisions should be made for the foundations of the proposed expansion. Stone & Webster Engineering Corporation served as consulting engineers.

Studies

The studies indicated that settlement had taken place because of compaction of the sand strata—caused by vibration induced in the soil by the reciprocating compressors. When the compressors were operating at maximum capacity, vibration transmitted through the ground could be felt 300 to 400 feet away from the building.

Alternative sites located within a reasonable distance along the pipeline did not show materially better foundation conditions and would have been expensive to develop, since it would have been necessary to duplicate the living quarters, water supply, cooling towers, and other facilities already available at the present site. Extending the existing compressor building also was considered undesirable, since the soil close to the existing plant had been densified by the vibration and this densification decreases rapidly upon moving away from the building. Under these conditions, sharp differential settlements would develop.

The consulting engineers recommended that the two new compressors be placed within the plant site and that the underlying soil be stabilized by densifying the loose sands prior to construction. A



PICTURE, TAKEN DURING SETTING UP OPERATIONS, SHOWS DRIVING RIG BEFORE SKIP WAS INSTALLED.

location was selected about 600 feet north of the existing compressor building and borings were made. The borings showed medium to fine loose sands, similar to the sands under the existing building, extending to a depth of more than 100 feet, and covered with 6 to 8 feet of medium clay-silt.

While loose sand deposits have not been particularly troublesome in the United States, there are sections of the world where they are commonly encountered and where damaging settlements from vibration occur frequently.

Compaction Methods

Two basic methods for densifying deep lying sand deposits, developed and used extensively in Germany, are driving of sand piles and the Vibroflotation method. From studies of comparative cost and availability of equipment, it was decided to use the sand pile method on the Blythe project.

In this process a large diameter casing with a closed end is driven into the soil with a steam pile hammer, thus densifying the soil both by the vibration set up during driving and by the reduction of the sand bed's volume by displacement of the sand piles. This casing is filled with sand and then withdrawn, leaving the sand in place in the ground.

The contractor on the Blythe project, the Western Foundation Corporation, used a heavy drive casing having an outside diameter of 16 inches. This casing was open at the lower end and had a close-fitting inside core which could be removed from the top. The core and casing were driven to-

LOADED SKIP IS SHOWN FILLING PILE WITH SAND.

gether by a single acting hammer having a 7500-pound ram falling 39 inches. This hammer was attached to the core so that lifting the hammer automatically raised the core.

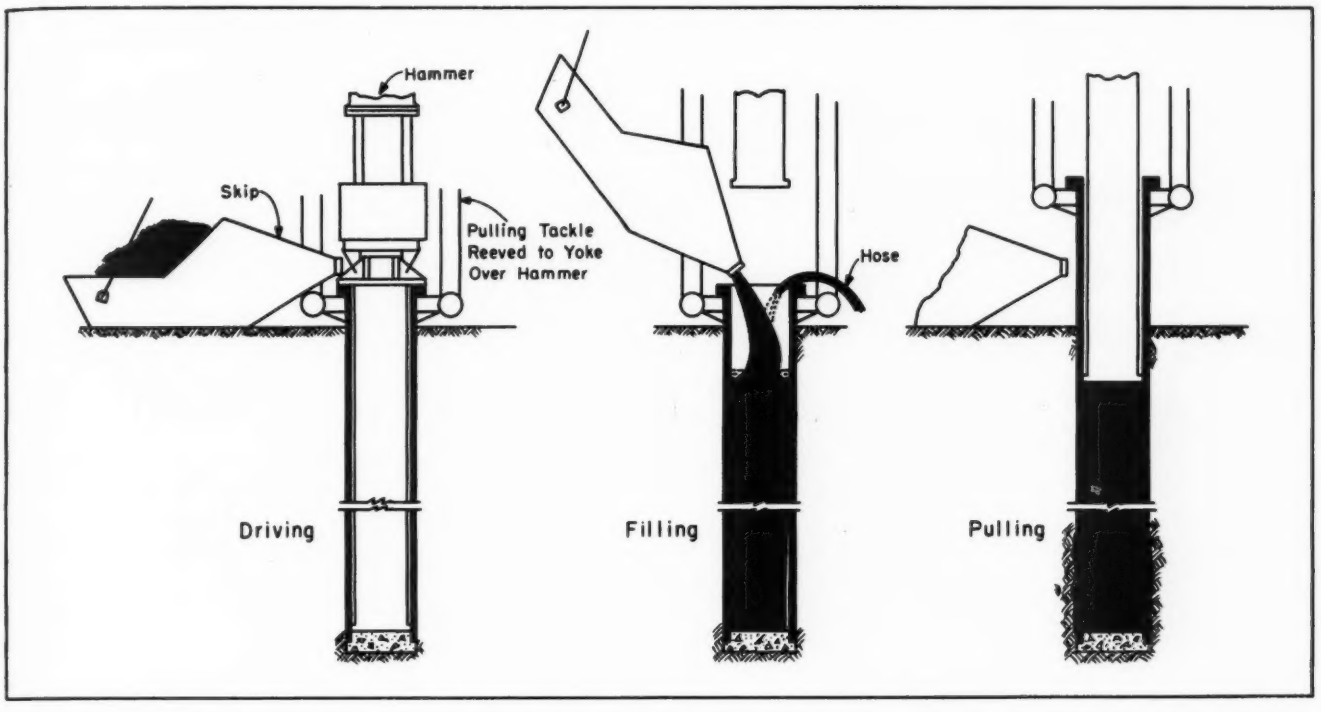
Prior to driving, a precast concrete plug which fits the lower end of the casing was placed on the ground. The core and casing were then placed over the plug and were driven. The hammer was raised upon completion of driving, thus removing the core. The casing was then filled with coarse sand of carefully selected grading having sufficient water added to completely flood it so as to prevent bulking and arching which might occur with damp sand.

The sand was extended well above ground level to provide enough to form a shaft slightly larger in diameter than that of the drive casing, and the core was lowered into position. The equipment was so reeved that the force required to pull the casing was applied to the core, thus forcing the sand into the surrounding soil. With this system, it was possible to exert a force of more than 50 tons on the sand while removing the casings.

This method, developed and patented by Western Foundation Corp., is used by them to construct uncased, cast-in-place, concrete piles. Thus it was possible to use conventional pile driving equipment to accomplish this rather unusual purpose.

Since there was little precedent or experience in

EQUIPMENT IS SHOWN DURING PILE DRIVING OPERATION. NOTE FRONT END LOADER FILLING SKIP WITH SAND.



DRAWING ILLUSTRATES THE PRINCIPAL OPERATIONS USED IN THE SAND PILE METHOD OF COMPACTING LOOSE SAND.

the United States to use as a guide in driving sand piles, it was anticipated that modification of the program would be necessary to meet conditions disclosed as the work progressed.

Modifications

Initially piles were driven about 40 feet, but experience indicated the deeper lying sands were appreciably more compact than the upper sands, which permitted shortening of the piles. The average length of the piles for the entire project was 26 feet. It also proved desirable to increase the spacing of the piles from 4 by 4 feet to 4 by 5 feet.

Sand was densified to a distance of 20 feet on each side of the 40-ft wide compressor mats to insure uniform support under the mats. The length of the area compacted was 208 feet, which provides for the initial two units and for expansion of the plant within a year to a total of five units. This length extends 40 feet beyond each end of the projected five-unit plant to permit compaction of the sand for additional units without disturbing the initial plant. A total of 966 piles were driven.

Prior to the start of the work, a series of hubs was set into the sand and levels were run periodically during pile driving. Upon completion, 35,450 cubic feet of saturated, dense sand had been added to the site, equivalent to a layer two feet deep if spread over the site area. Level measurements indicated that, even with the addition of this considerable volume of sand, the site had subsided in some areas by as much as six inches.

It should be noted that sand piles were driven at Blythe to accomplish a different purpose than the sand drains or wicks which have been used extensively to increase the rate of consolidation of soft clays or silts, such as the sand wicks used in stabilizing the soft silts under the approaches to the San Francisco Bay Bridge and along the New Jersey Turnpike. Sand drains are driven through very soft, cohesive soils for the purpose of increasing the rate of consolidation by providing multiple drainage channels. The usual practice is to consolidate the soil by loading it with fill which is later removed. ▲▲

WORKMAN IS SHOWN CASTING CONCRETE PLUGS, USED AT THE TIPS OF THE PILES FOR CLOSURE.

A GREAT DEAL OF THE RUSH HOUR CRUSH IS CAUSED BY BATCH LOADING. CONTINUOUS PASSENGER CONVEYOR BELT SYSTEMS ARE DESIGNED TO RELIEVE THIS CONGESTION.

Passenger Conveyors Are Here

PAUL W. FREITAG, Jr.
Project Engineer
Industrial Products Division
Goodyear Tire & Rubber Co.

Paul W. Freitag, Jr. has been acting as coordinator of the passenger conveyor projects during the past year. A graduate of Valparaiso University (AB) and Purdue (BSCE), Freitag was a Goodyear field representative in the East prior to his reassignment.

THE IDEA of using a belt to move people is hardly novel. An experimental "moving sidewalk," using a crude arrangement of wooden slats on a chain drive, was a feature exhibited at the Columbian Exposition in Chicago in 1893. The moving platform at the Paris Exposition of 1900 was an ambitious enterprise—10,900 feet long; it carried over 7 million visitors during the course of the fair.

In the 30's, both for the Chicago Century of Progress and the New York World's Fair, the late E. W. Stephens, then sales manager of Goodyear's belt department, had envisioned the use of moving rubber belt sidewalks to transport the visitors. Plans were prepared but financial problems did not permit their completion. Through the years there have been many designs for adapting the principles of of conveyorization to human transport—some showed promise, but most were impractical.

The rapid development in recent years and the new concept of passenger belt conveyors was encouraged by Col. Sidney H. Bingham, General Manager of the New York City Transit Authority and a noted transportation consultant. Col. Bingham had

urged, as far back as 1948, the utilization of the passenger conveyor belt principle as a solution for a number of underground transit problems. Specifically, Col. Bingham had in mind a form of passenger conveyor to replace the aging subways presently in shuttle service between Grand Central and Times Square.

The challenge of designing a safe, practical, and economical passenger conveyor belt system was accepted by the Goodyear Tire & Rubber Co. Goodyear was joined soon after by the Stephens-Adamson Mfg. Co. Coordinating their engineering efforts, these two companies tackled the major problems of loading and unloading passengers, feasible speeds, allowable inclines, negotiating of bends and curves, and methods of accelerating and decelerating, among many other technical details.

New Concept

It is interesting to speculate as to why the concept of the moving belt passenger conveyor has been so long delayed in finding active support and interest. Especially since: (1) its direct commercial forerunner, the escalator or moving stairway, found a much earlier development and acceptance; (2) the technical knowledge and experience, both in the belting and conveyor industry, for some time have been adequate to cope with the problems of design and construction; (3) there are so many obviously crowded and congested passenger traffic conditions—municipal, commercial, and industrial—that lend themselves readily to the moving belt concept.

One answer may be that the idea of passenger belt conveyors is a revolutionary one. It is revolutionary because it embodies an entirely new approach, not only to the problem of transportation, but to the design, planning, and layout of cities. If broadly applied, it can affect the location and architecture of a variety of structures and projects, from airport terminals to shopping centers.

Both Goodyear and Stephens-Adamson had to initiate and continue their research, design, and experimental testing in the face of overwhelming skepticism. However, when scale models, among other evidence, clearly showed the feasibility of belt systems, many of these same skeptics (literally overnight) became staunch advocates.

Early Development

Early in the development work, the engineers found that the passenger conveyor problem resolved itself into two distinct basic phases. One phase involved moving passengers short straight distances at constant speed approximating the normal walking pace.

The second phase was the movement of passengers over longer distances with acceleration to— and deceleration from— considerably higher speeds. Travel could be around bends and curves and at variable velocities.

From this analysis, it was decided to evolve two

WILL TOMORROW'S SUBWAYS LOOK LIKE THIS? THE CARVEYOR SYSTEM MAY REVOLUTIONIZE SUBWAY TRANSIT.

independent passenger conveyor systems. The first system, called the "Speedwalk" (a Goodyear trade name), meets the conditions and limitations outlined in phase one. The second system, called the "Carveyor" (also a trade name), incorporates the "Speedwalk" as part of its over-all design to meet the conditions of phase two.

Speedwalk

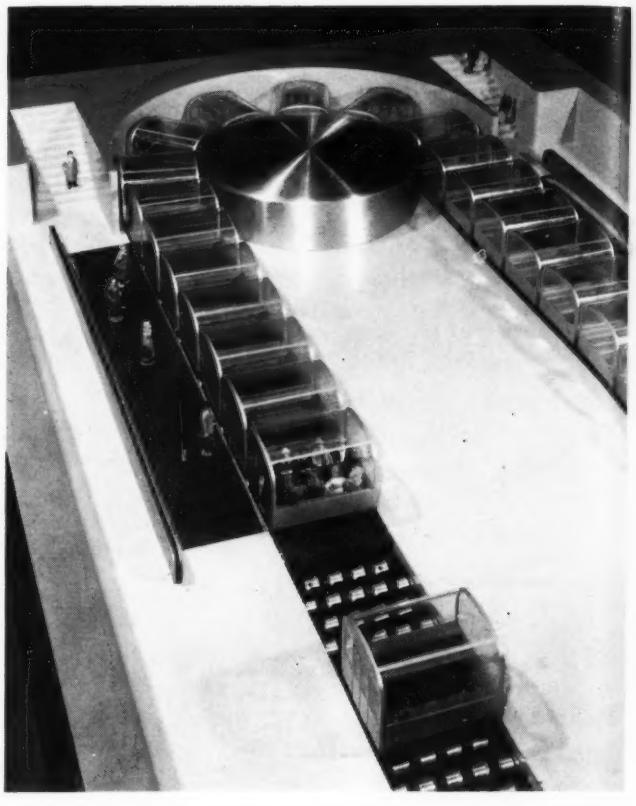
The Speedwalk is a continuous flat conveyor belt (the surface of which is smooth with no transverse cracks or openings) pulled by a motor drive. It can run over a set of closely spaced idler rollers or it can slide over a flat structural plate.

Experiments have shown that the Speedwalk will operate satisfactorily at speeds ranging from 100 to 250 feet per minute. However, 132 feet per minute (1½ miles per hour, or roughly half normal walking speed) is the currently proposed rate.

Using an electric motor drive with a variable speed transmission, it is a simple matter to regulate the speed of the passenger belt to whatever rate experience or conditions dictate. By using a reversible motor, the Speedwalk can be made to operate either backward or forward to meet the demands of morning or evening rush hour.

The most common construction has the belt running over closely spaced rubber-covered steel rollers mounted on sealed anti-friction bearings. Side guide idlers, spaced at long intervals, take up any side thrust of the belt. The belt should be at least 6 ply, 4 ounce, with an ⅛ in. cover on top and bottom. This thickness will eliminate any tendency of the passengers to "feel" the rollers under their feet. The motor drive can be hidden beyond the terminal point of the belt or below the surface.

A second design has the conveyor belt sliding over the surface of a flat plate structural steel member. The slider method has a distinct advantage in that it is considerably less expensive. However, if the length of the belt is very great or the load is heavy, there may be excessive friction between the belt and the plate. This could mean that the hp output required of the motor drive might reach an economically impractical level.



A VIEW OF THE WORKING MODEL OF THE CARVEYOR DESIGNED FOR THE TIMES SQUARE SHUTTLE SYSTEM SHOWS THE PROPOSED STATION LOADING PLATFORM.

The moving belt would have side enclosures or balustrading of anodized aluminum or painted steel panels. A steeply inclined (above 10 percent) Speedwalk, such as would be used in ramp sections,

A SPEEDWALK THROUGH DOWNTOWN BUILDINGS, AS SHOWN, COULD ALLEVIATE HEAVY STREET TRAFFIC.

CROSS SECTION SHOWS THE FIRST SPEEDWALK DESIGNED TO FACILITATE COMMUTER TRAIN TRAFFIC.

might have moving handrails. However, there would be no need for them on the horizontal runs. If desirable, the entry and exit portions can be guided by moving handrails. Using moving handrails considerably increases the cost of the Speedwalk.

The Speedwalk offers continuous, quiet operation, and freedom from dust, fumes, or vibration. Over long periods of service in regular industrial applications, conveyor belts have proven highly dependable requiring a minimum of maintenance and repairs.

In the event of a power failure, a mechanical brake will hold the belt stationary even if the Speedwalk is built on an incline. A stop button is located at both entrances to the conveyor to stop the machinery in an emergency.

Speedwalk units can be of varying widths, depending upon the desired capacity. Probably the most popular size would be a two lane unit using a 42 in. wide belt and having an outside dimension of approximately 5 ft.

Dead and live load on a typical cross section of a 42 in. roller type Speedwalk would total about 280 lbs per linear foot. On a slider type, this figure would total about 230 lbs. Using a per square foot loading basis, the total weights are only 56 lbs and 46 lbs, respectively. Most building codes for public passageways require a design that will safely support a 100 lb loading per square foot. Therefore, a Speedwalk unit could be installed in an existing building arcade or passageway without any additional structural reinforcing or extra bracing.

There are three proposed methods of exit or entry to the Speedwalk: (1) Entrance or exit at the beginning or end of the moving belt system or by depressing a length of belt beneath a stationary cross plate that also permits cross traffic. (2) A side angular plate cantilevered over the cross plate at zero clearance. A person may enter or leave by continuing his forward motion in the direction of belt travel. (3) The use of short paralleling belts going at the identical speed as the main belt.

Speedwalk units are safe. Entrance and exit are always in the direction of belt travel. A specially developed edge eliminates the chance of anything being caught and pulled down between the belt and the stationary surface at the point of exit as the belt descends around the pully. Should a person be standing still and absent-mindedly come to the end of the unit and not step off, he would smoothly ride off without any difficulty.

Limiting factors necessitate building the Speedwalk along straight lines. Surveys indicate that the practical limit of a moving sidewalk traveling at 1½ miles per hour is 1050 ft. The Speedwalk has been built at inclines of 12½ percent, and a 15 percent grade is believed to be the maximum allowable.

Plans are being made to draw up a code to cover the installation of moving rubber sidewalks either for adoption by municipal authorities or to act as a guide for local engineers and contractors.

The first commercial installation of a Speedwalk is presently nearing completion at the Hudson and

Manhattan Railroad Erie Station stop in Jersey City. This railroad is used by thousands of commuters who work in New York City but live in suburban homes in New Jersey.

Changing trains in Jersey City has meant a long walk through a passageway, including an uphill ramp. The particular grade on which the Speedwalk is being installed has been nicknamed "cardiac ramp" by the weary commuters.

The belt will be a 66 in. wide, 3 lane unit with a capacity of 10,800 people per hour. It will help disperse and spread the crowd besides offering them a new convenience and service.

This Speedwalk has an over-all length of 227 ft with 137 ft being on a 10 percent grade. The design calls for a roller type construction with a 20 hp electric motor drive. The belting will be approximately five-eighths of an inch thick, consisting of plies of fabric and rubber covering. The system has push button emergency stop controls.

Passengers will step on to the moving belt and will be carried (they can either walk or stand still) to the opposite end at the rate of 1½ miles per hour. The belt will be operated to move in the direction of the heaviest traffic. Paralleling the Speedwalk is a walkaway for the passengers going in the opposite direction. A possible extension, involving two additional units, is being considered.

Further Applications

Plans are underway to adapt the passenger belt to rail and bus terminals, airports, factories, understreet crossings, larger suburban shopping centers, and passageways of public and private buildings, as well as master designs for the long distances between parking areas and sports arenas, stadiums, or race tracks.

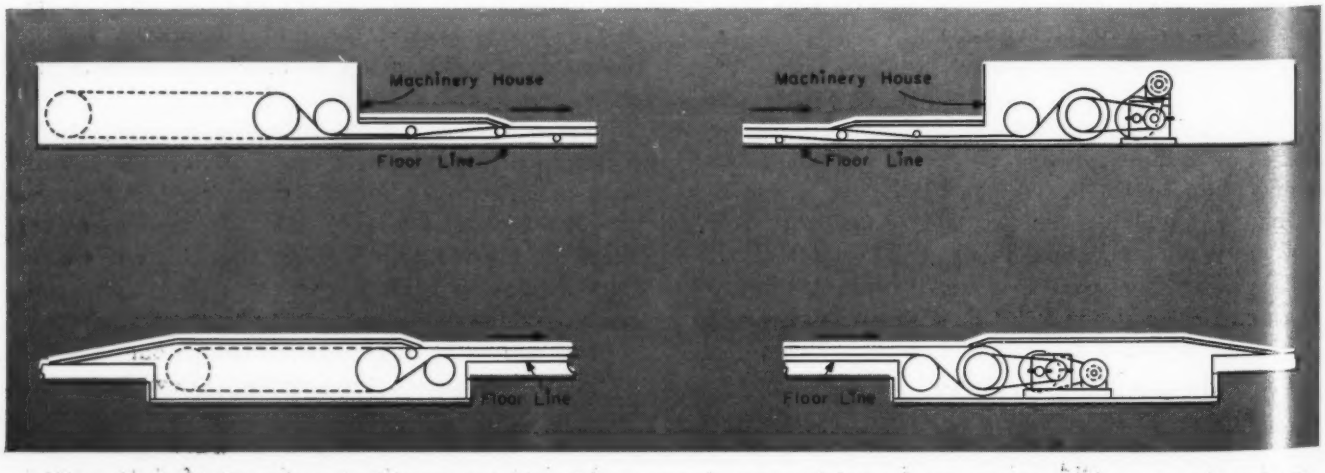
The world's first rubber belt sidewalk, a one lane unit, was tested at Goodyear in Akron during the summer of 1951 and proved the ease of entry, operation, and exit. In February of 1953, the Stephens-Adamson Co. and B. F. Goodrich Co. built a full size moving sidewalk (some 60 ft long) now on exhibition at the Chicago Museum of Science and Industry. It has proved to be a very popular display attracting an unusual number of people.

Carveyors

The Carveyor system was designed to meet the specific underground transportation problem of the subway shuttle service in New York City as originally outlined by Col. Bingham. The plan's basic feature is to provide continuous, two-way transportation between two specific points at speeds comparable with today's subway operations. The Carveyor incorporates the use of Speedwalks as loading and unloading platforms. Conveyor belts are also used at high speeds to transport small passenger cars between terminal points. Banks of pneumatic tired wheels accelerate and decelerate the cars and provide the means for making the necessary turns in the system.

Passengers, at the station platform entrance, walk on the loading belts which travel at 1½ miles per hour. Parallel to, and moving at the same rate, is the passenger car loading belt. Small passenger cars, with seats for 10 people in each car and room for five or six standees, ride on this belt. Nineteen cars enter the loading area and pass the loading platform every minute. There is no relative motion between the moving platform belts and the cars, as they are both traveling at identical speeds. The effect is the same as being on a stationary platform with a row of cars always waiting.

Because the small cars are actually over-riding the entering and exiting platform belts, there is no gap between the loading area and the car such as is found in any present day station having a raised



DETAILS OF DIFFERENT SPEEDWALK ARRANGEMENTS: UPPER LEFT, TAKE-UP AT FLOOR LEVEL. UPPER RIGHT, DRIVE AT FLOOR LEVEL. LOWER LEFT, TAKE-UP BELOW FLOOR. LOWER RIGHT, DRIVE BELOW FLOOR LEVEL.

platform. As the individual cars travel bumper to bumper through these areas, no one can fall, jump, or get pushed in front of oncoming cars. The tendency to delay trains by holding the doors open is eliminated. A continuous row of cars is always moving through the station and is able to handle all those who enter the loading belt. This feature is one of the system's principal advantages.

Doors open automatically as the cars reach the pre-determined loading point and slowly close prior to the time the cars leave the loading area and clear the platform. As an additional safety measure, a guard could be stationed at each platform in the area where the car doors close.

The passenger loading belt is 9 ft wide and 60 ft long. The car loading belt is of the same length, but 5 ft in width, since the cars overhang the belt.

When the cars have cleared the loading platform, they are gradually accelerated by a 74 ft bank of accelerator wheels which speed the cars from 1½ to 15 miles per hour. Spacing between the cars is increased to about 70 ft as they move on the main line conveyor belt running at a constant speed of 15 miles per hour.

At the unloading terminal, the passenger cars are slowed down to 1½ miles per hour on a similar bank of decelerator wheels. The cars are actually being braked and do not coast. Riding bumper to bumper on the unloading belt, the cars enter the unloading platform area and the doors open automatically. Passengers step out on the platform, which is moving at the same 1½ miles per hour speed, and walk or ride to the exit at the end of the belt.

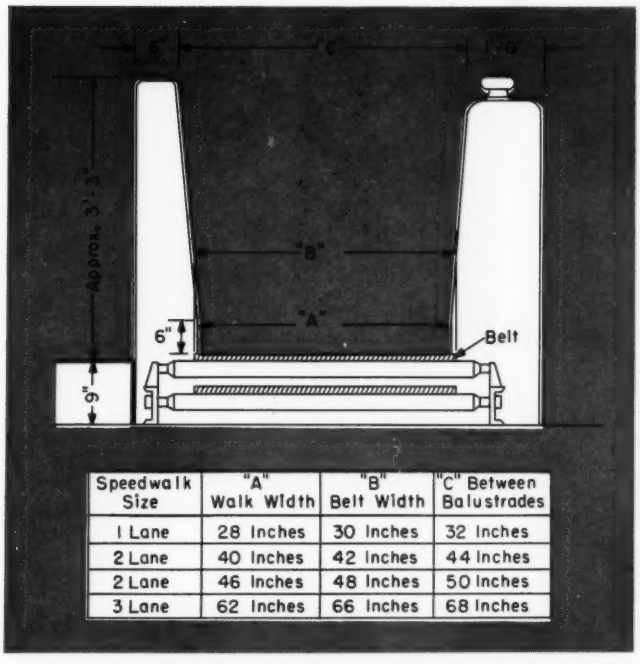
After unloading, the car doors automatically close, the cars are turned 180 degrees on banks of roller wheels, and again enter the loading area. Continuous operation will eliminate present waiting periods between trains and relieve rush hour congestion. Entry and exit are on opposite sides so that there is no cross flow of traffic.

Present shuttle running time is approximately two minutes along with an average waiting time between trains of two minutes. The time required to cover the same distance on the continuously moving Carveyor is just under two minutes and there is no waiting time.

Capacity of the Carveyor system is estimated to be about 18,000 passengers per hour in each direction, almost 50 percent more than the present hourly peak.

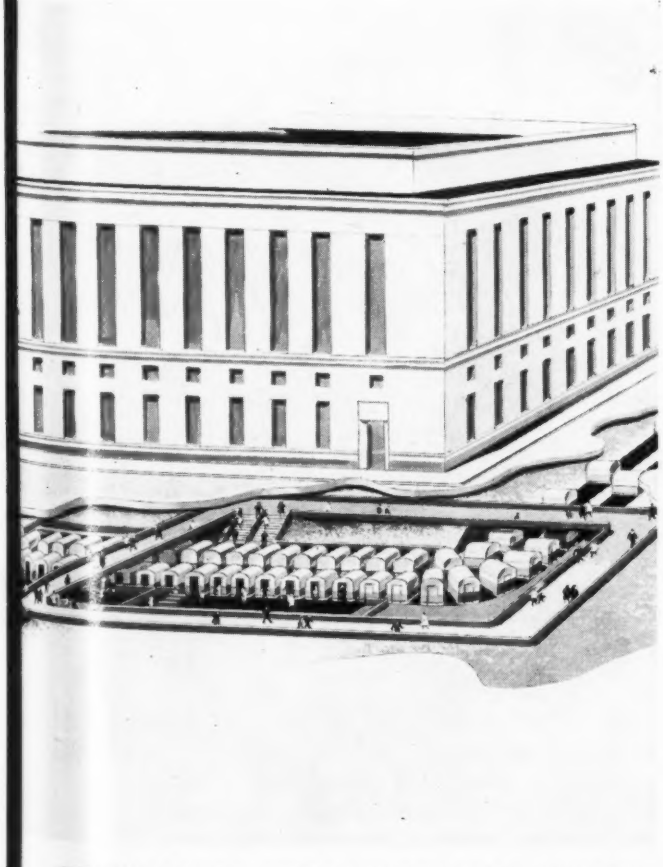
The distance between Grand Central and Times Square measures slightly more than half a mile. Preliminary estimates indicate that to replace the present shuttle subway with a Carveyor system would cost about $1000 per foot. This does not include any cost of tunnel modifications. It is important to note that the equipment cost per foot would be reduced if there were a greater distance between the terminal points so that the more expensive station and curve costs would be spread over a

—*Continued on page 82*



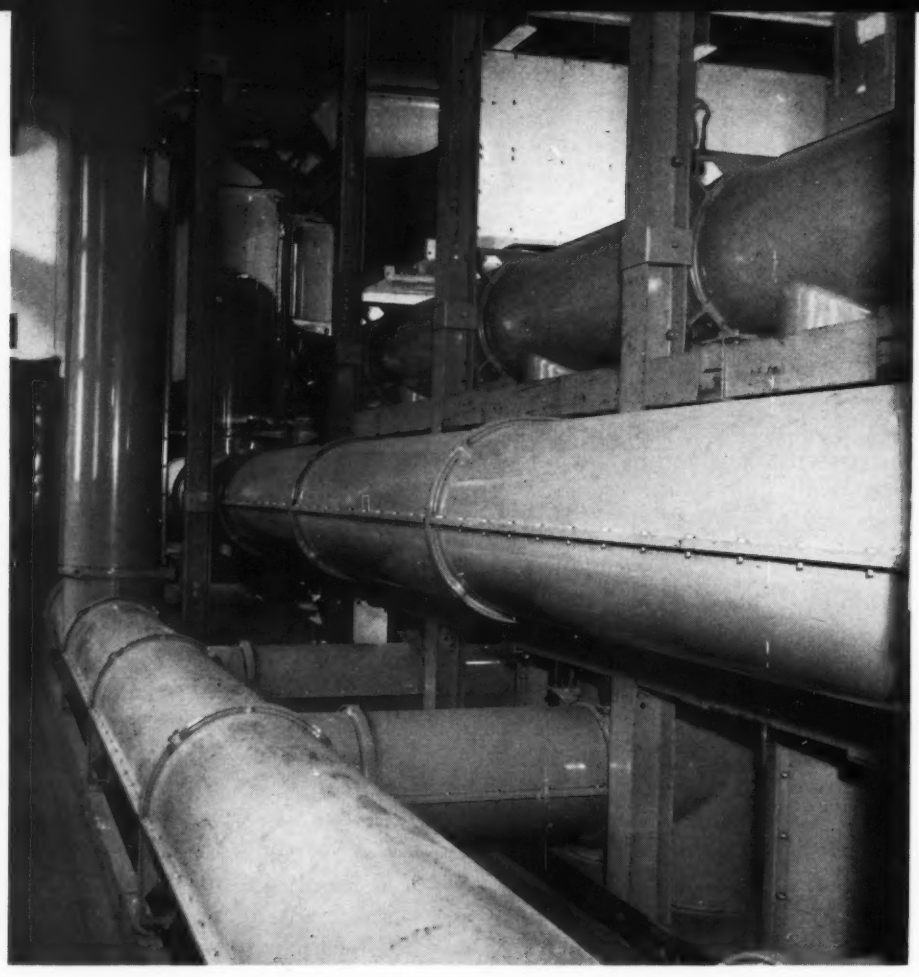
Speedwalk Size	"A" Walk Width	"B" Belt Width	"C" Between Balustrades
1 Lane	28 Inches	30 Inches	32 Inches
2 Lane	40 Inches	42 Inches	44 Inches
2 Lane	46 Inches	48 Inches	50 Inches
3 Lane	62 Inches	66 Inches	68 Inches

A MASTER DRAWING FOR DETERMINING DIMENSIONS OF VARIOUS SIZES AND TYPES OF SPEEDWALKS.



CUTAWAY SKETCH SHOWS LOADING AND UNLOADING STATION ON A DOWNTOWN CONVEYOR BELT SYSTEM.

CE exclusive



ISOLATED PHASE BUS IS SUPPORTED FROM STEEL COLUMNS AS IT ANGLES THROUGH THE INTERIOR OF THE STATION; TAPS COME OFF OF EACH PHASE.

Modernizing With Isolated Phase Bus

E. E. BROWN
Supervising Engineer
Philadelphia Electric Company

and

M. S. CARLSON
Chief Application Engineer
I-T-E Circuit Breaker Company

BETWEEN 1920 and 1924 there were installed in Philadelphia Electric Company's Delaware Station, six generators totaling 186,750 kw. The power from these generators could be directed to either of two main busses by means of selector breakers. The power was distributed by feeders at 13.2 kv. Ties to the 66-kv system were made in 1948 through two 75,000-kva transformer banks. The 66-kv system ties all generating capacity together to provide bulk power systems.

The main busses, the selector and main oil circuit breakers, reactors, test busses, and cable connections were put in successive elevations of a five-floor switch house. Construction of the switch house and the equipment used was typical of the electrical arrangement and type of construction in use at that time.

The two 13.2-kv main busses were located on the fourth floor, the arrangement consisting of two copper busses supported on station-type insulators, with each bus enclosed in a concrete compartment. Access doors opposite each insulator were provided. On the third floor were installed the selector breakers and stick-operated, isolating disconnecting switches. The main breakers and disconnecting switches were installed on the second floor. On the ceiling of the main breaker floor, the conductors between the selector and main breakers were connected to form an "H" tie. The current limiting reactors were installed on the first floor. On the ground floor were the outgoing cables and generator leads along with the test bus facilities.

In 1946 it was decided to rehabilitate portions of the switch house to improve service reliability, to reduce equipment hazards due to oil-filled equipment, and to minimize system disturbances. A

ring bus was planned, doing away with the selector arrangement of the two main busses. To do this, one of the concrete enclosed main busses was removed. The remaining main bus was used to complete the new ring bus to be located on the floor below.

Ring Bus Installed

All equipment was removed on the selector circuit breaker floor. On this floor was installed the isolated phase bus with ring bus sectionalizing, compressed air blast circuit breakers. The ends of this bus were connected to the remaining concrete bus on the floor above. No changes were made to the remaining equipment on the second floor and below. With the completion of this project, approximately half of the oil circuit breakers were removed from the station and the bus changed from a straight double bus arrangement to a six-section ring bus.

In order to limit the short circuit duty, reactors rated 5 percent, 2500 kva, were placed between the first and sixth sections and between the third and fourth sections. Two bus tie breakers, each rated 2500-mva interrupting capacity, were used between each of the six sections with a firewall separating the two circuit breakers. A phase-to-ground fault is limited by two 4-ohm, 2000-ampere, cast-iron-grid station neutral resistors operated in parallel.

Isolated phase bus for the ring bus using air and porcelain for insulation was adopted after considerable study showed the following advantages: construction is sturdy and compact; phase-to-phase faults are eliminated; the ground bus is capable of carrying a phase-to-ground fault; porcelain is used to its best advantage (which is in compression only); safety for operating personnel is good; ease, flexibility, and low cost characterize the installation; and minimum maintenance is required.

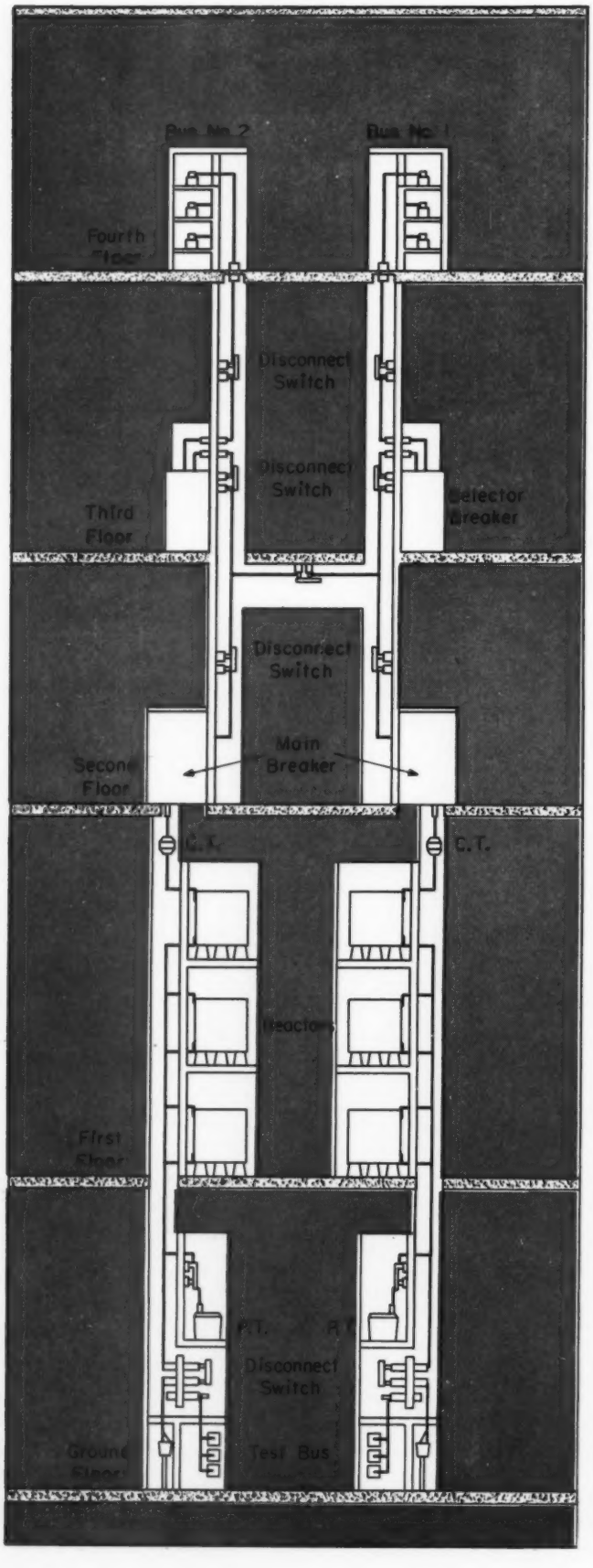
Space Limited

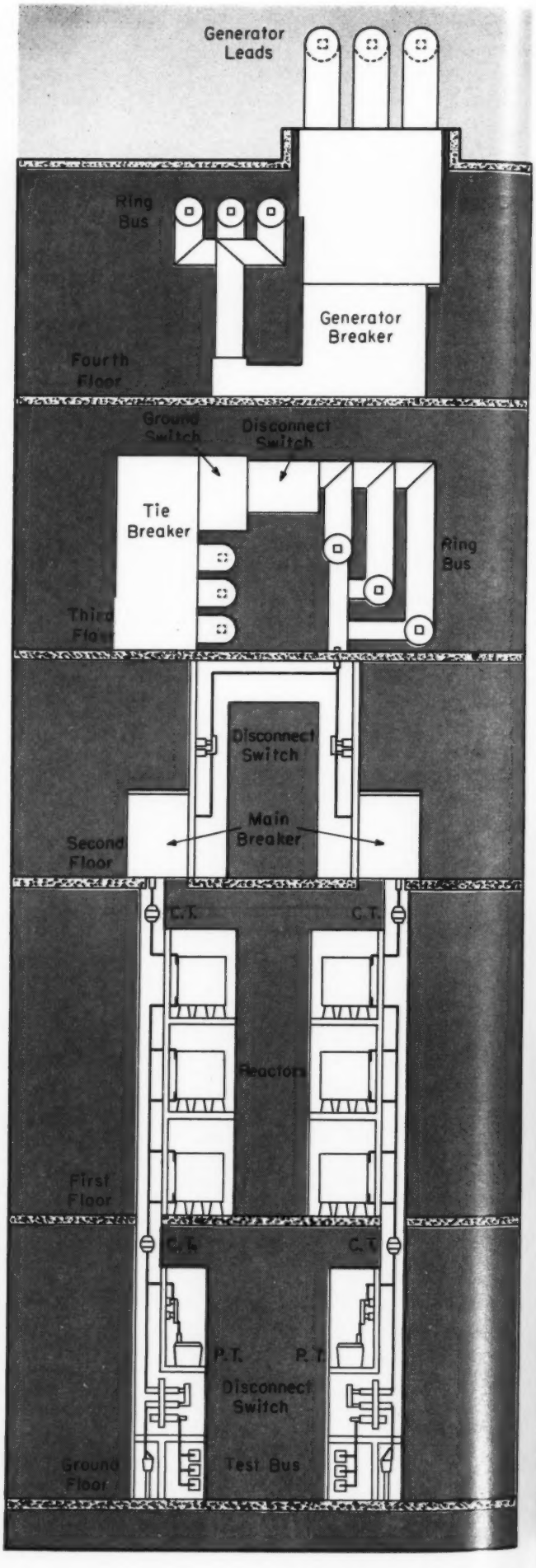
Each section of the new bus was limited to the space made available by the removal of the old equipment. The problem was further complicated in that each section of bus has a generator or transformer connection plus feeder and bus tie connections. The main bus, taps, and ties were variously rated 2000, 3000, 4000, and 5000 amperes; they were designed to test at 50 kv for one minute and 110-kv impulse.

The addition in 1953—adjacent to the existing station—of units 7 and 8, each rated 125,000 kw at 0.5

COMPLETED INSTALLATION SHOWING ISOLATED PHASE BUS RUNNING ALONG OUTSIDE WALLS AND OVER THE ROOFS.

CROSS SECTION OF SWITCH HOUSE FOR A TYPICAL FEEDER SECTION BEFORE MODERNIZATION (BELOW) AND OF MODERNIZED SWITCH HOUSE (RIGHT); MOST OF THE NEW WORK IS ON THE UPPER FLOORS.





psi hydrogen, was predicated on supplying the local 13.2-kv load with more efficient generating units and utilizing the old generators to feed into the 66-kv bulk power systems when required. To accommodate the new units, it was necessary to break the present ring bus of six sections into two ring busses of three sections each. The two ring busses are then tied together through reactors, keeping the same fault interrupting duty requirements.

Ring Bus Space

The fourth floor of the switch house where the old concrete bus was still installed provided the space for the establishment of the two ring busses and the connections to the new generators, with only minor change to the former modernized six sections of main bus on the third floor.

The generator leads presented a real problem because of the physical location of the new units with relation to the switch house. After much study, which included the use of cables, isolated phase bus again was selected as being the best and most economical method. Except for short runs inside the new station, most of the bus had to run outdoors; one generator lead goes over the roof, the other runs on the sides of the existing building. Both went through the roof of the switch house into the fourth floor. Each lead is rated 7000 amperes, 14.4-kv, with an insulation level of 50 kv for one-minute and 110-kv impulse. A single generator, air-blast circuit breaker was not available, so two 4000-amp, 1500-mva interrupting capacity breakers were used in parallel. The design of the isolated bus brought out three problems: installation, minimizing the use of gaskets outdoors, and inductive heating in adjacent building steel.

Installation Outdoors

The outdoor installation problem was answered by building a section of bus 14 feet long with the covers, insulators, and conductors all assembled and shipped in a three-phase section. This length was determined by the copper billet that could be drawn into the size of square copper tube required.

During shipment and installation, the ends of the

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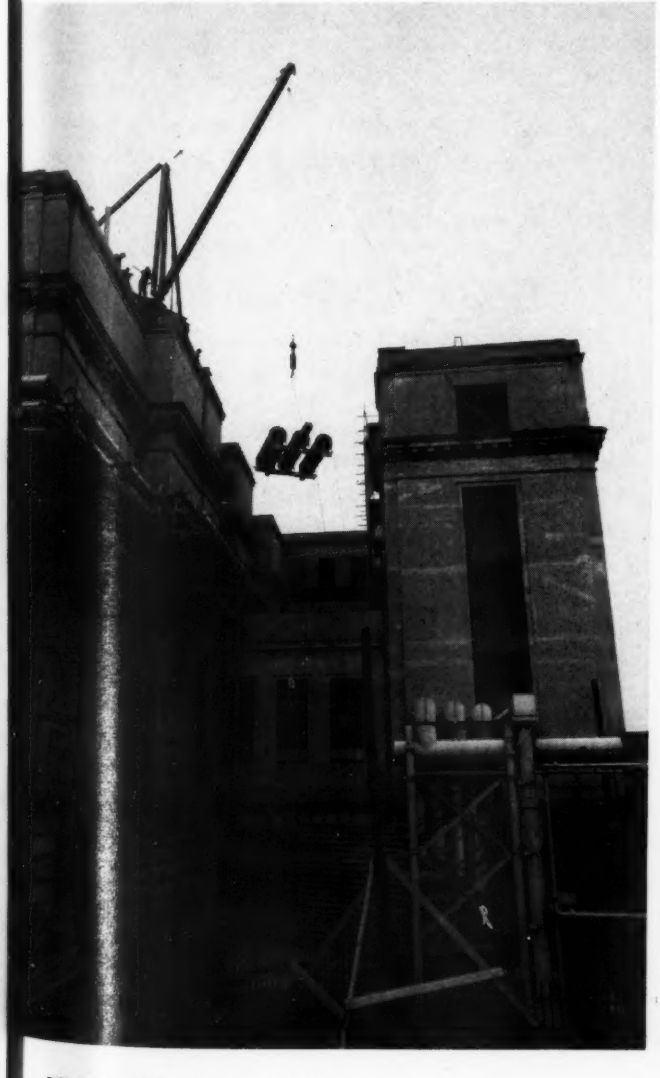
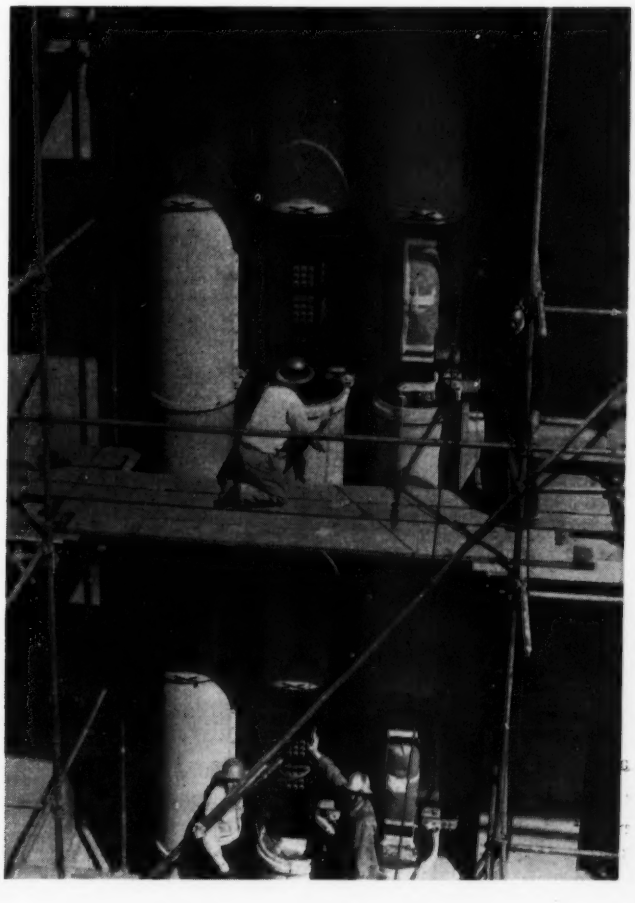
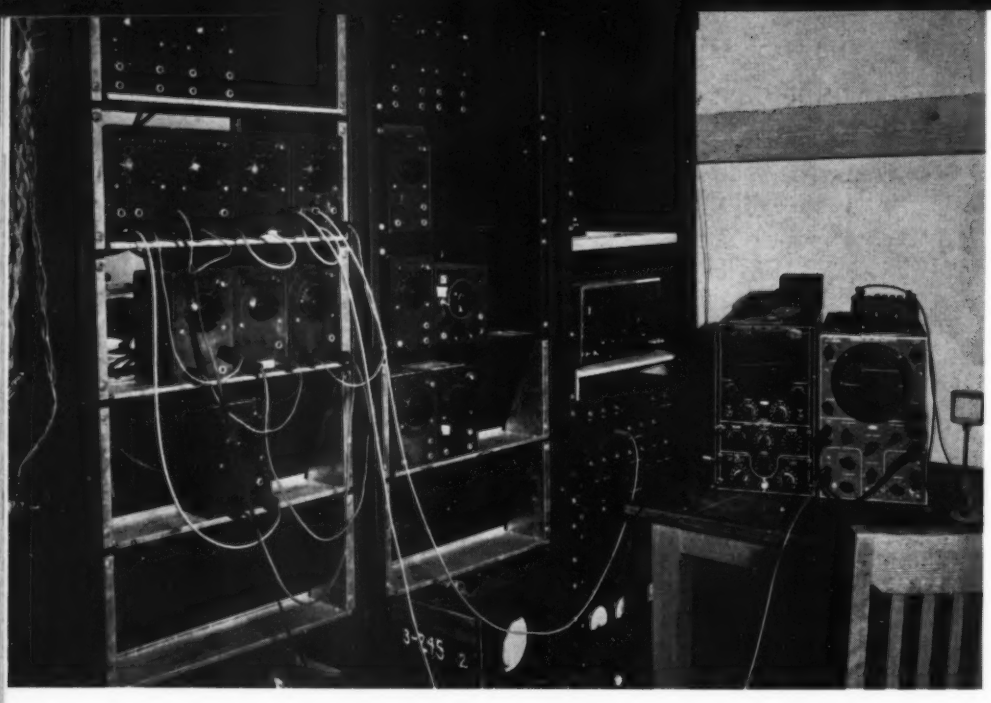


CRANES SET 4400-POUND, THREE-PHASE SECTIONS IN PLACE (LEFT) FOR ALIGNMENT; PROTECTIVE COVERINGS ARE REMOVED FROM CONDUCTOR ENDS AND THE BUS CONNECTORS ARE INSTALLED (BELOW).





ANALOG COMPUTERS ARE USED BY INSTRUMENTATION CONSULTANTS TO OBTAIN ANALYTICAL SOLUTIONS TO COMPLEX CONTROL PROBLEMS. THE FUNCTIONAL BOXES IN THIS VIEW REPRESENT THE COMPONENTS OF A SENSITIVE, PRESSURE CONTROL SYSTEM.

The Instrument Specialist

. . . A New Field for Consultants

CE exclusive

KARL W. PETERSON
Director of Field Engineering
CDC Control Services, Inc.

Mr. Peterson has had wide experience in the design of control systems and in the application of instruments to the process industries. A graduate chemical engineer from Pennsylvania State College, he is the author of many papers in the instrument field. Prior to joining CDC Control Services, Inc., he was associated with The Bristol Co. for sixteen years.

AS A RESULT of the important role which instrumentation plays in helping industry to achieve maximum production per dollar of investment, such terms as "automation" and "push-button-factories" are becoming common in the engineer's vocabulary. In some industries, such as the petro-chemical field, as much as twenty percent of the total cost of a plant may be invested in its control systems.

To provide the specialized know-how required for the practical application of control instrumentation, an entirely new species of engineer has come into being. This engineer concerns himself with such questions as: What is the optimum end product or result desired? What process variables must be controlled to bring about the intended results? How can they be measured and controlled? Within what tolerances? What equipment will do the job? How do uncontrolled variables affect those being controlled? How can the human element be minimized or eliminated? What about shut-downs and system failures? What about recent developments?

Large industrial concerns, particularly those which are constantly expanding and improving their processes, have found it necessary to establish instrument departments within their own organizations. However, only a few of these have adequate facilities for analyzing their requirements or for evaluating the many control components on the market.

The smaller companies cannot justify such departments. Consequently, they rely upon the instrument salesman for engineering information. Quite logically, the salesman is often biased in his recommendations and, since his is primarily a selling job, he cannot afford to become too involved in systems engineering. Furthermore, if a complete control system encompasses a variety of instruments which must be supplied by different manufacturers, no one supplier

can give the system the detailed attention that it requires, and no manufacturer is prone to guarantee the operation of a unit made by another concern.

Some of the latest developments in control are being made by small companies, usually manufacturing the one product. They, like others, are seeking volume sales and certainly it is unprofitable for them to devote too much time to special control problems.

Consultants

All of these factors create a splendid opportunity for any consulting engineering firm which specializes in process control. Such an organization can be of real service to the average user of control instruments. It can provide the unbiased judgment, the background of experience and, if it has the facilities, the test and analytical equipment to determine the best possible solution to any control problem for any process. The consulting firm's interest and responsibility ends only when the final objective—satisfactory performance—is a reality.

An interesting example of the work performed by a consulting firm specializing in automation engineering is found in the case of Ehret Magnesia Manufacturing Company of Valley Forge, Pennsylvania. This company has been making magnesia insulation and pipe covering for many years. When its progressive management made plans for a new plant, they decided upon the maximum utilization of instrumentation. They envisioned a plant as fully automatic as practical for their products.

As a consulting firm specializing in process control, CDC Control Services, Inc. handled the control phase of the project as subcontractors under The Kuljian Corporation, whose engineers designed the new plant. The control system developed as a result of this cooperative effort permitted a two-thirds reduction in the man power required, as compared to the old plant. Even more important, product uniformity is greatly improved and the number of rejects have been radically reduced.

In another instance, an important government facility required a complex, automatic pressure and temperature control system for a supersonic wind tunnel. CDC Services, Inc. was commissioned to prepare the specifications for the control system.

The requirements were completely analyzed, utilizing extensive field and laboratory tests. Since consultants have no proprietary interest in any instruments or equipment, the evaluation of the components was completely unbiased.

Detailed Specifications

Stringent requirements were written into detailed specification lists. By eliminating vague or general specifications, bidder's "contingency" mark-ups were avoided. As a result, an estimated saving of 15 percent of the final cost of the system was achieved. In comparison, the consultant's fees equaled about 7 percent of the cost. The importance of clarity with respect to details in specifications was further emphasized by the fact that all the bids ranged within 5 percent of the lowest.

The value of testing and evaluating the performance of instruments was stressed by a recent project in which an instrument manufacturing company submitted a bid of $114,000 on a control system based on rather general specifications. Because the figure exceeded the appropriation, a group of instrument consultants were called in to check the possibility of reducing the cost.

These engineers found that even at the high cost, the control instruments which had been proposed would not satisfactorily produce the desired results. By spending $25,000 in engineering and laboratory time, the consultants were able to furnish detailed specifications for instruments that would meet the requirements and would cost only $55,000. The result was a system which satisfactorily performed the desired function—and at net savings of $34,000.

Unquestionably the field of instrumentation, more than any other field, merits the distinction of having contributed the most towards the simplification of plant operations during the last decade. The instrument industry has grown so rapidly that it has been practically impossible for interested "outsiders" to keep abreast of new developments. Manufacturers of instruments, for the most part, design their units for a mass market. There are many industries outside these mass markets that could benefit immeasurably by even simple instrumentation.

Design and Application

The design and application of automatic control to industrial operations requires considerable study, experience, and a fundamental understanding. These are the basic characteristics of consulting automation engineers whose interests involve:

¶ Automation of processes and machinery that defy the use of standard components.

¶ Simplification of information gathering—through scanning, calculating, and data reducing—to improve operator efficiency.

¶ Bringing to management a broader appreciation of automation in terms of its affect on unit production costs.

The cost of the consultant's services can be easily justified. The savings resulting from the proper application of instrumentation far outweigh the initial cost of the instruments. After all, what is the value of a $100 temperature controller if it regulates a $1000 retort to produce $10,000 worth of product a week?

The potential value of an instrument has nothing whatsoever to do with its cost. Value must be determined by comparing production rates, quality control, and labor costs per production unit for a process operation with control instrumentation as against the same operation without controls. ▲▲

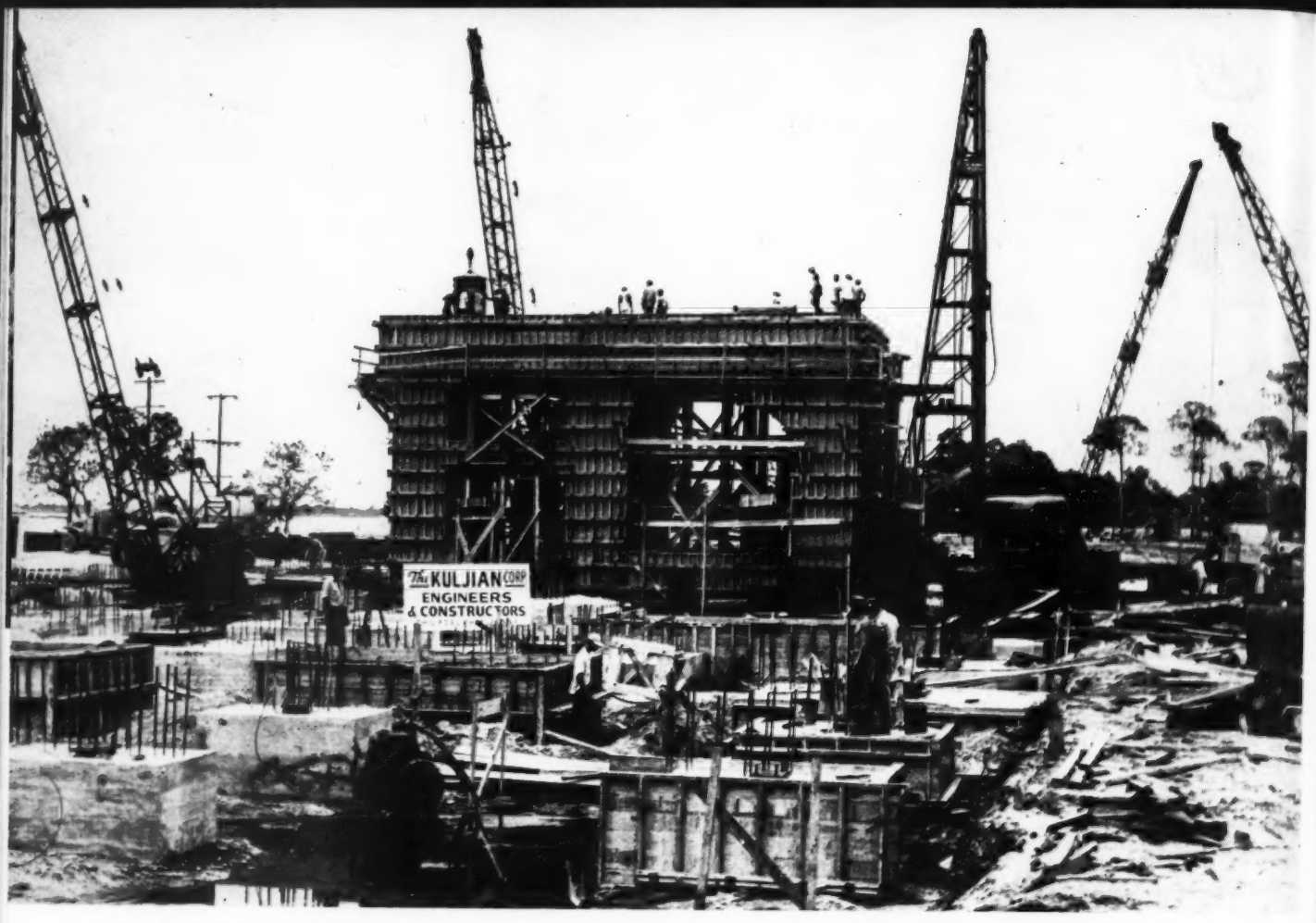


FIG. 1—PHOTO, TAKEN TO RECORD SEQUENCE OF OPERATIONS, SHOWS FINAL POUR OF GENERATOR FOUNDATION.

The Value of Progress Photographs

EDWARD J. HEALY
Manager, Construction Division
The Kuljian Corporation

CE exclusive

Mr. Healy lists twenty-four years of construction management experience on projects varying from office buildings to chemical plants. He is a graduate of Massachusetts Institute of Technology, majoring in electro-chemical engineering, and is a registered professional engineer. Prior to joining The Kuljian Corporation, he was associated with Turner Construction Company, Keystone State Construction Company, and the Pennsylvania Railroad.

TAKING PROGRESS photographs on a job under construction may strike some executives as more or less of a nuisance chore. Too often it is slighted or overlooked altogether. Our own experience in the handling of many diverse projects, both in the United States and abroad, has strengthened our conviction that the faithful performance of this chore serves a number of important ends, and at times may prove of inestimable value.

Progress photographs indicate quickly and clearly

the status of the job. Not only is the current situation pictured and the sequence of operations indicated, but also any lack of neatness or any carelessness in the operation usually shows up clearly.

At the home office all progress photographs are critically examined by comparing them with field progress reports and progress schedules in order to see that all activities on the job are as planned, both as to timing and sequence.

A careful examination of progress photographs often makes it possible to break up bottlenecks before they occur. The photos often are credited with heading off wrangling and disputes, thus helping to conserve the mutual good-will so necessary in keeping construction work moving ahead.

Because of the evidence offered by actual pictures and the legitimate conclusions drawn from them, progress photos have long been used as a means of averting lawsuits. They also have eliminated or substantially reduced damages for personal injury by indicating that all reasonable precautions to avoid personal injury were taken during the course of the construction work.

Sequence of Operations

In addition to routine progress photographs, extra pictures should be taken to cover matters of specific interest. The beginning of a particular operation, such as the start of structural steel erection or the starting of brickwork, should be recorded. Also, any indication of a particular method or sequence of operations should be photographed.

On one project, involving the construction of a 40,000 kw generating station, our client was extremely anxious to get the equipment into operation without being involved in extra construction cost. A delay in the delivery of the structural steel was experienced and, rather than delay construction work, the sequence of operations was changed. We immediately proceeded with construction of the generating unit foundation. The final pour was in progress when the photograph, Fig. 1, was taken.

In addition to recording the change from initial plans, this photo shows the high degree of coordination on this project. It indicates the status of the excavation, pile driving, pouring of pile caps, and setting of billet plates. The photo also records the receipt of a portion of the structural steel, which can be seen in the background.

Start of an Operation

Another project involved an addition to an existing generating station, including a new boiler and generator. The new turbine was a combination condensing and topping unit and involved a rather complex series of mechanical, electrical, and structural "tie-ins". It was necessary to schedule these "tie-ins" and all construction work to fit in with

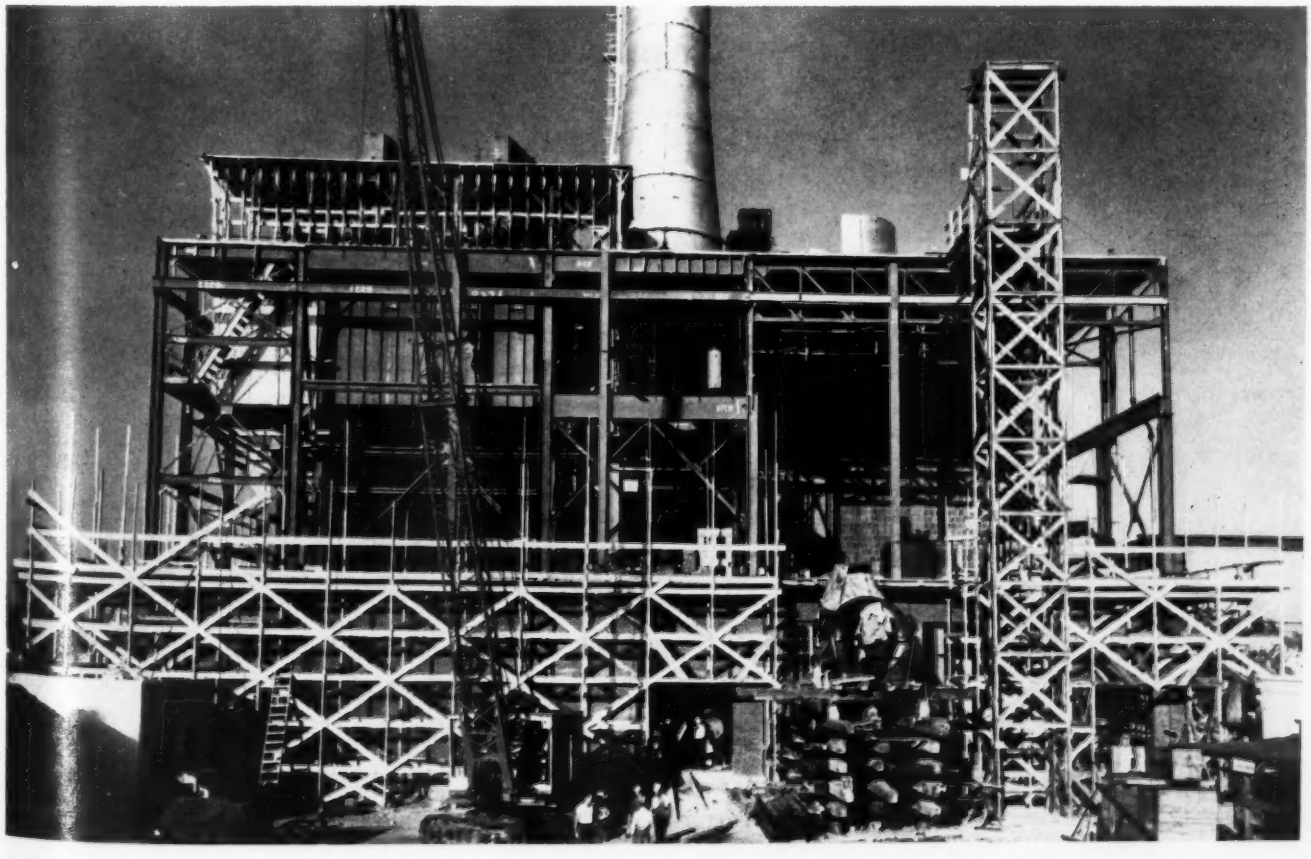


FIG. 2—THIS VIEW WAS USED TO SHOW CLIENT HOW WORK HAD BEEN COORDINATED TO MEET PLANNED SCHEDULE.

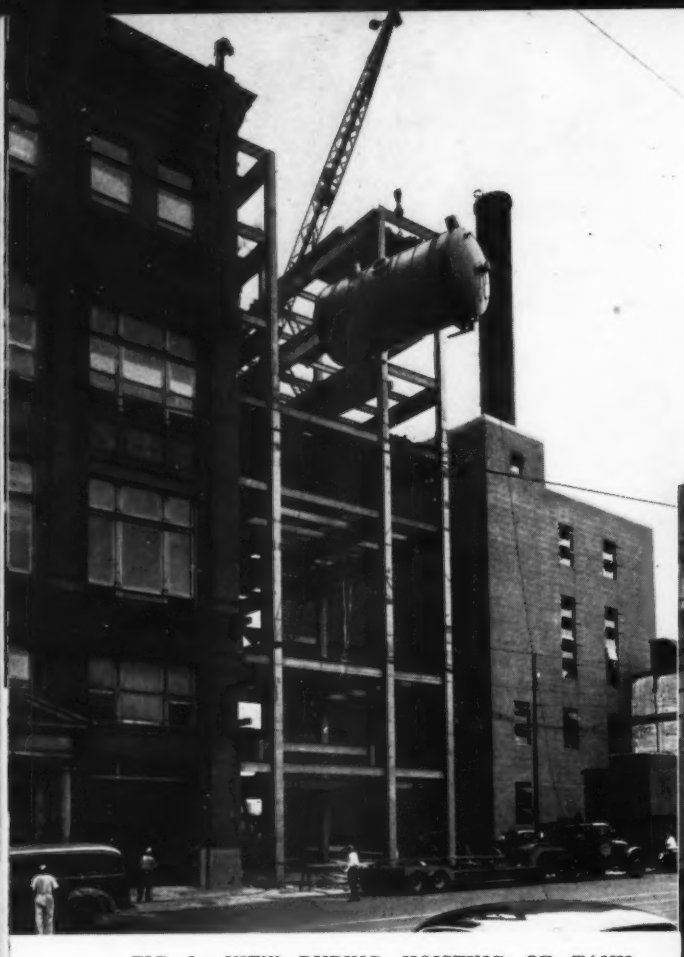


FIG. 3 — VIEW DURING HOISTING OF TANK SHOWS WALK PROTECTION MOVED TO RIGHT.

FIG. 4 — PHOTO PROVED TO TANK VENDOR THAT DELIVERY DATE HAD BEEN COUNTED ON.

carefully predetermined shut-down possibilities and with scheduled maintenance shut-downs.

The progress photograph shown in Fig. 2 was taken at the start of the brickwork to indicate the careful planning and the positive action which had been taken in accordance with the planned schedule. This picture proves that the necessary preparations have been made to move the generating unit into the building so as not to delay the brickwork.

The photo also provides an excellent record of the progress on many other portions of the project. It shows that the structural steel work is complete, and that the concrete has just been completed. The top fan house slab has not yet been stripped. The boiler is about 60 percent completed, and auxiliary equipment such as stageheaters, the deaerator, and the condenser have been installed. One ring of the stack, visible on the roof, indicates that stack construction is not yet completed.

This picture was shown and explained to a group of stockholders from our client company with excellent effect.

Photographs also should be taken during the installation of large equipment. Such pictures will record the exact methods used to handle the equipment and will show any changes in access to the job or in public protection. The photo shown in Fig. 3 illustrates a situation which is not unusual.

Equipment Installation

This project involved an addition to an existing brew house, and required very close coordination between the erection of the structural steel and the installation of brew house equipment. Sidewalk protection, shown in Fig. 4, was placed after the first lift of structural steel had been erected. The progress photo shown in Fig. 3 was taken during the installation of a combination mash tub and cooker. The picture clearly indicates the necessity for temporarily moving the sidewalk protection which can be seen at the right. It also shows that a temporary barricade had been put in place.

Another aspect of the same project also is shown in Fig. 4. In addition to recording the installation of a tank, this picture serves to show construction methods and to indicate the sequence of operations.

The scaffold outriggers were set as soon as the structural steelwork was completed so that masonry could closely follow the concreting. The brickwork at the top of the elevator shaft is being completed,

and where the wall is finished the scaffold has been removed to permit placing the tanks on the roof.

Throughout the project it was necessary to coordinate the installation of brewing equipment with construction of the building. Because of a delay in the delivery of four tanks, it was necessary to maintain the guy derrick on the roof after the structural steelwork and concreting had been completed. The timing was close, however, as is shown by the fact that the front top concrete spandrel has not yet been stripped.

From this picture, the tank vendor definitely recognized that the promised delivery date for the tanks had been counted on, and he would have, if pressed, contributed financially to the cost of keeping the derrick in place.

Safety Precautions

Progress photographs also should be taken to record any specific precautions employed to prevent personal injury. The photo in Fig. 5 was taken to show the use of life nets stretched across an open space in which a 600,000 lb per hour steam generator was to be installed.

This project involved the removal of a much smaller boiler, and revision of the existing structure to take the larger unit. Immediately after the old boiler was removed, two life nets were stretched across the furnace space at different levels and were kept in position at every possible moment until the tubing of the new boiler was started. These life nets actually saved two men from serious injury and possible death.

Progress photos are not expensive. We seldom take more than ten or twelve on any one project in a month. More often, five to six routine pictures per month are sufficient.

Local Photographers

We generally use the services of a competent local photographer whenever one is available. We insist on receiving the negative, however, and photographers sometimes balk at this. In such instances, or where the job is in an isolated spot or in a foreign country, The Kuljian Corporation makes good use of their own Crown Graphic cameras. The Project Superintendent in charge of each job is provided with a camera and the necessary attachments including flash gear, light meter, tripod, wide angle lens, and filters.

A complete pictorial file on each job is kept at the home office. The negatives (4 x 5 in.) are filed in one unit, and the enlarged prints of all negatives in another unit.

By providing positive answers to questions concerning the relative progress of various items, timing, sequence, methods, and safety, we have found progress photographs to be extremely valuable in checking the status of construction and in helping to achieve completion of each construction project in the shortest possible time and at the lowest possible cost. ▲▲

FIG. 5 — PROOF OF PRECAUTIONS TAKEN AGAINST PERSONAL INJURY IS IMPORTANT IN EVENT OF A LAWSUIT.

Motorola

TWO-WAY RADIO KEEPS LINE-STRINGING CREW IN TOUCH WITH EACH OTHER AND WITH CENTRAL DISPATCHER.

Two-Way Radio for Utilities

W. C. BRYSON
Superintendent of System Operations
Duquesne Light Company

Motorola

McKEESPORT DISPATCHER CALLS LINE TRUCK OFF MINOR REPAIR JOB TO ANSWER EMERGENCY CALL.

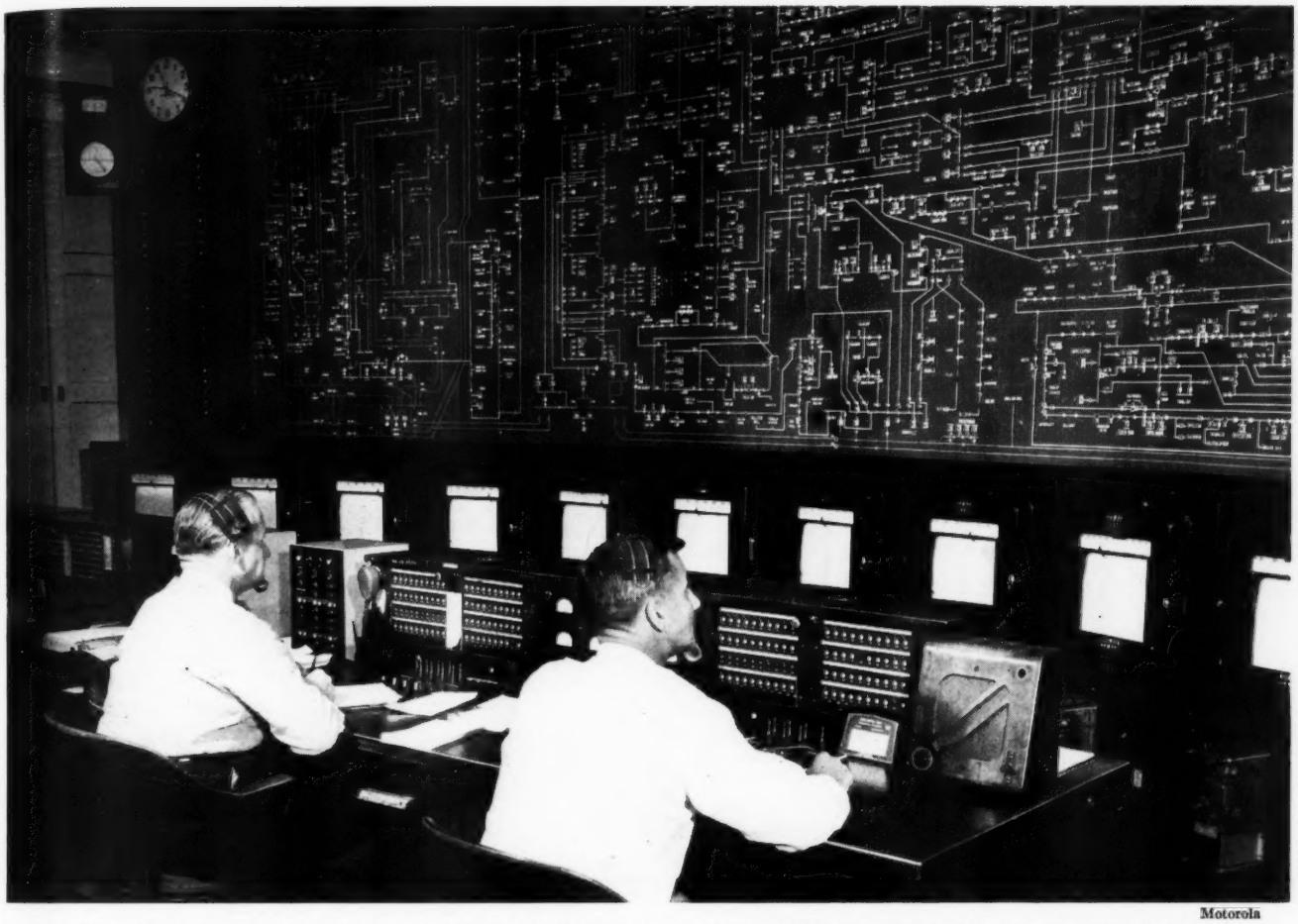
CE exclusive

MORE EFFICIENT UTILIZATION of the abilities of men and their tools was one of the prime factors in the decision of the Duquesne Light Company to install an extensive two-way radio system. The men who made the decision reasoned that mobile crews and their tools represented a considerable investment. It followed that any waste of their time was prohibitively expensive. Without a completely adequate communication system, some waste of costly time was inevitable.

Tailored Network

The two-way radio network is tailored to fit the physical characteristics of the area and the organizational structure of the company. The area served is divided into six sections by the Transmission and Distribution Department: North, East, South, West, Central, and Downtown. Local dispatchers of the North, South, Central, and Downtown districts jointly and remotely operate the main base station.

For system-wide switching and over-all control, the load dispatcher operates the main base station. When necessary, he has messages relayed via any of the other seven base stations. At the Dravosburg and Valley substations, the base stations are operated by local dispatchers. The base stations are never used for point-to-point communication under Federal



Motorola

CENTRAL DISPATCHER USES RADIO TO HELP COPE WITH ANY CONDITIONS SHOWING ON SYSTEM DISPLAY PANEL.

Communication Commission rules except in crises when the normal means of communication are out of operation.

The Substations and Shops Department is separated into four divisions, each of which operates through the load dispatcher and the base stations under his control. Two more base stations, one a standby unit, are controlled by the load dispatcher. They are installed at the main radio station on Mount Washington, one of the highest points in Pittsburgh. Between them, the eight base stations blanket the area served by the power company.

More than 80 mobile units complete the system. The trucks are used in servicing, maintenance, and construction of utility's facilities between the generating stations and the consumers' utilization devices.

Use Handie-Talkies

In addition, Duquesne has several "handie-talkie" radiophones which operate on a different frequency than the base and mobile radio system. These units are used wherever widely separated crews must coordinate their activities.

For instance, in stringing transmission line towers, crews work on two or three consecutive towers simultaneously. If they were dependent on a messenger for communication, operations would halt from time to time with a consequent severe loss in man hours. With the lightweight portable "handie-talkie" units in use, messages are exchanged in a matter of seconds. No time is lost in waiting for a messenger.

Selective Signalling

Still another electronic refinement, a "quik-call" selective signaling system, has been added to the radio network at the four generating stations. With over 80 mobile units and 8 base stations operating on 1 frequency, the system begins to approach the saturation point; all the receivers are receiving messages a good part of the time.

With a "quik-call" system, however, all the generating station radio receivers are normally silenced. When the dispatcher wishes to call a particular generating station, he first sends out a coded four-tone signal which closes the audio circuit in the addressed receiver only. Thus, generating station personnel are not bothered by calls intended for truck crews.

Before the radio system was installed, the crews and the dispatcher were dependent upon the telephone for communication whenever the crew was out of the garage. This was strictly an intermittent one-way communications street. Except under unusual circumstances, the dispatcher could not initiate a

—Continued on page 80

Acme

The New York Association of Consulting Engineers is an outstanding example of a local organization that is actively engaged in professional and ethical development. Consulting engineers in other areas can well use this group as a guide to effective organization.

NYACE Activities Build Prestige

CE exclusive

THE NEW YORK Association of Consulting Engineers this year marks the thirtieth anniversary of its founding with a solid record of achievement. Organized for the safeguarding of "good engineering practice and the promotion of more satisfactory business relations of its members with their clients; maintenance of a high professional standard; interchange of business experience among its members; and promotion of cordial relations between its members," the NYACE has strict membership requirements — enforced to the letter.

These requirements determine, to a large extent, the character of the organization, business interest of its members, and professional goals it seeks.

Membership Requirements

Eligibility of an engineer or engineering firm for membership in the NYACE is described in Article II of the Association's Constitution, which reads: "The membership of this Association shall be composed of licensed professional engineers (and of firms and/or corporations, principal members of which are licensed professional engineers) planning the mechanical, sanitary, electrical and/or structural equipment and design of buildings, or of similar work in the construction industry, engaged in the independent practice of their professions, with offices located within a radius of 60 miles from City Hall, New York City.

". . . Should any member, as a result of changes in business relations, no longer meet the above requirements, he shall automatically cease to be a member of this Association."

One of the key phrases in this section of the Constitution is "engaged in the independent practice of their professions." A definite distinction is drawn between engineers in business for themselves and those employed by non-engineering companies or groups. "Engineers who are actually employees of architects, contractors, manufacturers, public utilities, or governmental agencies, are ineligible for membership."

The present membership comprises 41 firms and individuals, and includes all of the well-known New York area consulting engineering firms handling mechanical, electrical, and structural design and supervision work in the building industry. Since a large portion of the building construction throughout the nation originates in this area, the NYACE membership accounts for a large share of the nation's consulting engineering business.

Member firms vary in size from those which have large staffs and handle a large annual volume of business to individuals with their own practice, frequently in some specialist branch of the profession. The size of an organization and its work volume has no relationship to eligibility for membership in the Association. The major criterion is one of professional standing and reputation.

When an application for membership is considered, the implied question is: "Does the applicant practice and maintain the highest standards of the engineering profession and of the New York Association of Consulting Engineers?"

By maintaining this high standard, the NYACE has developed an active organization with some notable accomplishments and has unquestionably added to the prestige of the engineering profession.

Activities

An example of NYACE activity was a cooperative action with the New York Chapter of the American Institute of Architects in which standard Architect-Engineer Contract Forms were prepared to ensure

that contractual agreements between architects and engineers will be fair to both parties. These forms were modeled upon the "Standard Form of Agreement Between Owner and Architect," drawn up by the American Institute of Architects for the protection of its members.

When New York City officials are confronted with highly-technical suggested amendments to the city's building code, they often turn to the NYACE for expert opinion. The Association always cooperates in these matters.

Should soil tests be changed? The city officials turn to the NYACE, which sets up a special committee to study the problem and make specific recommendations. Committee members chosen, of course, are specialists in the field they are called upon to analyze.

Should ventilating plans be filed and, if so, what form should the filing take? These and other problems are handled either by special committees or, in some instances, by standing committees. A committee of structural engineers, for example, would deal with a proposed change in the building code for multi-story structures.

The Association also conducts technical negotiations with various other groups to establish standards and codes. Alert to the electrical requirements of our modern way of life, with its television sets, air-conditioning units, automatic washers and driers, and literally dozens of other appliances, the NYACE has long realized the importance of maintaining adequate wiring standards. As a result, when Consolidated Edison Company of New York launched a campaign to educate the public and builders to the importance of maintaining high standards for wiring, Con Edison invited the NYACE to join in the campaign, and the Association readily agreed.

Fee Schedules

Another activity is the negotiation of fee schedules with various New York City and New York State agencies to maintain a standard for engineering fees. The NYACE, for example, has reached specific agreements on the matter of fees with the New York City Housing Authority and the New York City Board of Education.

The many activities of the Association add to its prestige. The prestige, in turn, enables the Association to protect its members on such matters as "bid shopping," where attempts are made to obtain low competitive fee bids from engineers.

In this connection, a recommendation of the Association that is widely followed in the New York area is that an architect, before signing his own contract for design of a building project, must name the consulting engineers — mechanical, electrical, and structural — that he intends to use. A further recommendation is that the architect's client should stipulate the fee to be paid to the engineers — such fees to be in accordance with the Association's fee schedule.

Luncheon meetings, held once a month during the winter months, are skillfully organized to yield direct benefits to the membership and to the Association. Usually a guest speaker is invited to discuss some topic of direct interest to the membership, and the discussion is based on a question-and-answer system in order to be as productive as possible.

Typical of these meetings was one held recently at which the New York State Architect was the speaker. The subject under discussion was that of the fees offered by the State for engineering and architectural services. Many of the members brought architects as guests because of their common interest in the problem. As a result of this meeting, the New York Association of Consulting Engineers and the New York Chapter of the American Institute of Architects agreed to cooperate in negotiating new fee standards with the State.

Annual Award

Another activity of the NYACE is the presentation of an annual award, given to an outstanding public figure in the New York City area whose activities directly affect the Association's members. One of the recipients of this award was Robert Moses, who earned a national reputation for his work as New York City's Construction Co-ordinator and for his many other activities, including the building of a series of parkways on Long Island.

The Association also is publishing a manual which will include its Constitution, By-Laws, Code of Ethics, Schedules of Fees, and Standard Forms of Contracts drawn up with the New York Chapter of the American Institute of Architects. The manual will be distributed free to all AIA members in the New York metropolitan area, and also will be distributed by the NYACE members.

Pre-publication requests have come from a number of consulting engineers in other states who are interested in establishing local associations of consulting engineers.

Pool Draftsmen and Designers

Also noteworthy is the recent move by the Association to set up a pool system for employment of draftsmen and designers so that member firms can "loan" employees to each other to suit varying labor needs as the engineering load fluctuates. This move benefits both the consulting engineer and the draftsmen and designers, because it tends to prevent the practice of hiring and firing which normally has to be followed by engineering firms as their business volume changes.

With each accomplishment, the NYACE has gained momentum and has found new goals to be attained, new conditions to be improved, and new benefits to be derived by its members. ▲▲

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States Continue Competition To Attract New Industries

ACTIVITIES aimed at attracting new industries and fostering the expansion of existing plants are continuing at an accelerated pace in the competition between the states. A significant trend has been toward promotion of privately financed development corporations to provide industrial expansion risk capital unavailable through normal banking channels. These organizations are attracting increasing interest as an alternative to proposals for use of municipal or state credit to finance industrial plant facilities for lease to private industries.

Direct or indirect use of municipal credit for industrial plant financing, such as is currently authorized by legislation in a number of states, including Alabama, Illinois, Kentucky, Louisiana, Mississippi, Nebraska, Pennsylvania, and Tennessee, would suffer a crippling blow from a pending Congressional measure which would remove federal tax exemption privileges from industrial development revenue bonds.

New Proposals

Proposals are now being considered in both Michigan and Virginia for the enactment of legislation to permit formation of privately financed and operated state credit development corporations.

Michigan's Governor Williams recently noted that "six New England states have already experimented successfully with this idea. Through such a corporation, participating banks, insurance companies, and other financial institutions would be able to provide a pool of venture capital to aid new enterprises and small business. By spreading the risks, such a corporation would be able to finance many enterprises unable to get capital from ordinary sources."

In Virginia, State Senator L. C. Bird announced he would seek enactment of state legislation authorizing the creation of a private development credit corporation that would serve as a statewide clearing house of information and aid to new industries that might be encouraged to locate in the state. He said it would be similar to the New England corporations, drawing membership from businesses which benefit directly from industrial expansion.

The Maine Development Credit Corp., which pioneered this new approach to raising long-term venture capital for small business in the New England area, now has $563,850 in loans outstanding, according to its president, A. F. Maxwell. Since it was started three years ago, the corporation has loaned a total of $770,000 to 28 companies, received between 300 and 350 applications for loans, and has incurred losses totaling $8345.

Additional Activity

The New Hampshire Business Development Corp., the second such organization formed in New England, has granted 11 loans since July 2, 1952, totaling $256,000, according to its president, E. B. Whittemore. Seven of the loans were granted to firms already located in the state, while four assisted outside firms in locating within the state.

One of the privately financed state credit organizations formed last year, the Massachusetts Business Development Corp., recently registered an issue of 150,000 shares of $1 par capital stock with the Securities and Exchange Commission. The organization has announced that it expects to sell some of the shares to labor unions in the state, as well as to business and financial interests. It was pointed out that labor unions and their members, as well as businesses, benefit from industrial development.

The Rhode Island Development Co., also formed last year, made its first move by voting to puchase the Warwick Mills, West Warwick, for $225,000. About 220,000 square feet of the plant would be leased back to the former owners, Warwick Mills,

Inc., while an additional 220,000 square feet would be rehabilitated for lease to new industries.

An engineering survey, conducted for the Rhode Island Development Co. by the consulting firm of Arthur D. Little, Inc., recommended that the state, in seeking to attract new industries, should look particularly to companies in the fields of electronics and instrument manufacturing.

Engineering Surveys

In line with the spreading trend toward engineering surveys of industrial development potentialities, the 1954 Virginia legislature will be asked to provide funds for such a study by Virginia Polytechnic Institute. J. W. Whittemore, dean of engineering and architecture and director of the Virginia Engineering Experiment Station at VPI, expressed belief that such a survey would "return the investment many times over in terms of added revenue and other important but less tangible results."

Further exemplifying the trend toward new and more comprehensive state-sponsored surveys, the Kansas Industrial Development Commission approved a research program to be conducted by the Midwest Research Institute. Commission Chairman, H. L. Stevens announced that the research is expected to furnish facts which can be used in long-range planning to bring new industry into Kansas, as well as to implement the growth of present industry in the state.

Among the many phases of the survey will be a study of industries which have located in the state since World War II, and the reasons why they selected Kansas over other Midwestern states. Industries which located in other Midwestern states also will be studied to determine their reasons for not locating in Kansas.

Harbor Facilities

Various engineering surveys, conducted for states or municipalities with harbor facilities, have emphasized the need for expanding and improving these facilities as an incentive to attract industry.

The Virginia State Ports Authority recently received a comprehensive engineering survey report from the New York firm of Coverdale & Colpitts outlining 25 recommendations for expanding port traffic.

The report called for unification of the three major port segments of the Hampton Roads area (Norfolk, Portsmouth, and Newport News) to eliminate rivalries and to combine the area into a port comparable to the Port of New York. Among other proposals were recommendations for empowering the authority to furnish and operate necessary port facilities not available through private enterprise, and equalization of truck transportation services and tariffs to Hampton Roads ports.

By virtue of their rate equality with Baltimore and a rate advantage over New York and Philadelphia, the survey report stated that Virginia ports could compete with these ports for Midwestern business in efforts to obtain more foreign trade.

An economic and engineering survey of North Carolina's small ports and inland waterways resources is being made by Parsons, Brinckerhoff, Hall and MacDonald, a New York engineering firm retained by the State Conservation and Development Department. The survey, authorized by the 1953 state legislature, will cost about $47,000 and will take about eight months to complete. Its scope covers 41 counties.

In explaining plans for the North Carolina survey, Col. L. F. Rhodes of the engineering firm said, "The study will include recommendations for increasing volumes of tonnage and decreasing costs of cargo handled through the deepwater port facilities of North Carolina by means of connecting barge routes with deepwater seaports, railroad, and trucking terminals." The master plan also will show where railroad and highway transportation is indicated, and where such facilities as electric power, water supplies, sewers, housing and warehouses should be established.

A $91 million Delaware River channel project between Philadelphia and Trenton has been proposed by Army Engineers. The channel would be 40 feet deep from Philadelphia to Newbold Island, and 35 feet deep from the island to Trenton.

Studies

In Rhode Island, a three-member executive committee and a six-member advisory committee were set up as the first steps in a study of the economic potential of the Port of Providence. The committees will work together and with outside consultants to define the area of study required to determine if the state and surrounding areas are capable of generating more business for the port, and whether present facilities can handle any increase in volume.

In another Rhode Island industrial development move, the State Development Council has urged local communities to establish credit corporations to assist in financing industrial expansion. Funds would be raised from outright donations and from the sale of stock, and would be used to attract new industries and even to build new plants.

A 273-page study released by the Rhode Island Development Council under the title, "An Introduction to the Economy of Rhode Island," indicated that the plight of the state's textile industry is the central problem in Rhode Island's economic picture, but that most other branches of the state's economy are sound and "are little affected by the basic factors which have caused textiles to move South." Prepared on the basis of research, both by the council and outside agencies, the report is offered as an up-to-date inventory of the state's resources. ▲▲

the Range Finder

DR. GERALD J. MATCHETT

Department of Business and Economics

and

Director, National Center of Dynamic Equipment Policy

Illinois Institute of Technology

WHEN RECOMMENDING new equipment, the consulting engineer in the past had only to weigh two possibilities—to buy or not to buy. Only in a few isolated instances (shoe manufacturing machinery and computing equipment quickly come to mind as examples) was leasing industrial equipment prevalent. In recent years, however, there has been a rapid expansion in the use of rented capital equipment. Increasingly, the possibility of leasing is one alternative which must be considered when recommendations and decisions are made about machinery acquisition.

When any new practice takes hold in the business world we can be sure that it does so because it offers the likelihood, at least, of meeting some real need. Leasing arrangements in particular may, under appropriate circumstances, yield certain advantages to both parties to the transaction.

Capital Requirements

The user of capital goods—the lessee in the leasing arrangement—finds that leasing eliminates the need for large amounts of investment funds. Capital for the purchase of equipment has always been a factor operating against machinery replacement. Even when a new machine offers impressive operating advantages over an old one, lack of capital may override all other considerations.

In periods of business recession, it has been common practice for equipment users to postpone new investments. If a leasing program can be a means for moderating the cyclical behavior of the equipment market—and some producers think that it can—the importance of the program is obvious.

Leasing may be an answer, too, to the reluctance of many firms to tie up capital in operations of a somewhat experimental character. By using rented equipment, a business can minimize the risks entailed in entering production of a new product or in altering production methods.

But the characteristic of the leasing arrangement which is desirable to the lessee—the relatively small amount of capital needed for the acquisition of new equipment—is a disadvantage to the manufacturer who leases rather than sells his product. He finds it necessary to have capital resources far in excess of those required if the equipment were to be sold outright. In the absence of sufficient internal funds, he may be compelled to finance the program through the sale of stocks or bonds, thereby incurring risks not assumed by other manufacturers. Under some circumstances capital for leasing programs has been secured through banks and other financial organizations.

Lessee-Lessor Relationship

In some leasing contracts, the lessor has no more control over the lessee's business operations than in situations where equipment is simply sold. In others, however, the equipment maker attempts to protect his investment by supervising the activities of the user to some degree. The amount of control in these cases varies with the individual contract. It may be nominal; at the other extreme, the lessor may attempt to control the type of product being produced with the equipment or restrict the lessee's freedom to purchase supplies.

The close relationship which often exists between lessor and lessee under leasing has both desirable and undesirable elements. Constant contact with individual customers permits the equipment manufacturer's research and engineering staff to understand more clearly and readily the problems and needs of the equipment users. Ideas can be more easily exchanged regarding needed improvements and developments.

The supplier is also in a position to learn of operating deficiencies in his product which otherwise might have remained unknown to him. This knowledge can help retain the customer's goodwill if the

manufacturer provides service and repairs as soon as they are needed. However, if the lessor is unable to service the facilities himself he may have difficulty enforcing proper maintenance standards, and accelerated depreciation may be the result.

Where the lessor exercises any substantial control over the use of the equipment, the lessee's freedom of action is correspondingly curtailed, and this is one fact that he must weigh against the advantages of the arrangement.

Length of Lease

The length of the leasing period will depend on the nature of the equipment and the type of operation for which it is to be used, as well as on the rental policies of the two parties involved. As a matter of fact, the period called for may determine in itself the advisability of entering into a leasing agreement.

Where it is possible to rent for very short periods of time, the lessee will find that he can keep idle and unused capacity to a minimum by leasing equipment for peak periods in his business. When the level of operations returns to normal the rented equipment can be returned. He can also tailor his machinery inventory to the particular production requirements of the moment, permitting a maximum in production efficiency.

A short-term arrangement is also advantageous when a potential purchaser of equipment is uncertain as to whether it is economically sound to invest money in a new machine. If he can lease on a short-term basis, he is able to postpone investment until a more definite decision can be made. He can, indeed, accumulate experience with the machine and can use this experience in reaching his final decision.

In some cases, however, this is not feasible. When the facilities are so highly specialized that they have little if any value for other purposes, it is usually necessary for the manufacturer to supply them on a long-term lease which may in effect amount to purchase on an installment plan. In other cases, prohibitive installation and transportation costs may compel the lessor to insist on a long-term lease. Either situation would of course make renting less advantageous to the lessee.

Obsolescence

Leasing permits the lessee to shift the risk of obsolescence to the equipment manufacturer, in the sense that a fixed rental fee is substituted for an uncertain obsolescence loss. He avoids, also, the necessity of disposing of old equipment. There are some real advantages to this latter fact in terms of economic efficiency. The lessor may be in a more favorable position to sell the equipment because of his greater familiarity with potential buyers. Leasing may therefore contribute to the mobility of equipment, permitting the introduction of machines —obsolete for one purpose—into other lines of production for which they are still adequate.

Taxation

Where the leasing contract provides that the lessor retains clear title to the equipment, the lessee may regard rental payments as business expenses for tax purposes. Thus he can in effect write off the cost of the facilities over the precise period during which he is leasing. This situation is in contrast to that where equipment is purchased; owned assets must be depreciated over periods established by the Treasury Department as appropriate for the particular type of equipment.

Where a lease contains an option-to-purchase clause, there may be considerable doubt as to the legal and tax status of the agreement. Where no additional or only a nominal payment is required to obtain title to the equipment at the end of the rental period, the courts have ruled that the lessee is acquiring an equity in the equipment under his schedule of payments, and therefore such payments can not be considered a business expense for income tax purposes. However, if it can be shown that the monthly payments were not "disproportionate to the terms of the user in relation to the value of the articles" the transaction is considered a bona fide lease rather than a conditional sale.

In any event, no specific rule or formula has been spelled out to guide the prospective lessee and lessor in determining what the implications of a purchase option clause will be. Work is being done at this time to clarify the issues; meanwhile industrialists should be advised to proceed cautiously when entering an agreement of this type. Naturally, the problem does not exist where no option to purchase is included in the contract.

Study in Alternatives

Leasing arrangements are a comparatively recent development. Businesses not yet making use of them may find it to their advantage to do so. Affording the possibility of a more flexible and more efficient supply of machinery without the necessity of large capital expenditures, leasing has many qualities to attract equipment users.

Producers, on the other hand, may find in it favorable means of market expansion. Thus in some cases the arrangement may be profitable to both sides. Whether or not it is mutually profitable must of course depend on the individual situation.

As in the case of other questions in equipment policy, careful study and analysis of the terms proposed as well as of the relevant costs in other alternatives must precede a final decision. It appears, however, that leasing is a solution to a number of problems in the capital equipment field. It merits consideration in a good many situations.

the Legal Aspect

MELVIN NORD

Consultant in Legal and Technical Problems
Registered Professional Engineer
Chemical Engineer
Patent Attorney

THE WORD "LAW" is used in several different ways, often without clear perception of which type of law is being considered. Thus, we speak of "laws of nature" and "laws of society." Each type of law represents an explicit rule or proposition which "governs" certain conduct. Laws of nature govern natural phenomena, and laws of society govern social behavior.

Pound's Analogy

The close analogy between engineering and law has been very aptly stated by the former dean of the Harvard Law School, Roscoe Pound, who said that law is "social engineering." It is very important for both engineers and lawyers to understand this fact—and it is unfortunate that they do not.

Not only are engineers and lawyers generally ignorant of the close relationship between their fields, but they are proud of their ignorance! Lawyers take particular delight in pointing out that, "After all, you know, law is not a science." This has been given as the excuse for poor law for centuries.

Engineers frequently study a little law, but lawyers are usually ignorant of engineering. They would be well advised, however, to learn how the engineer uses the laws of nature to solve practical problems. For without a "social engineering" approach, law is simply a metaphysical exercise in psycho-logic.

Find the Optimum

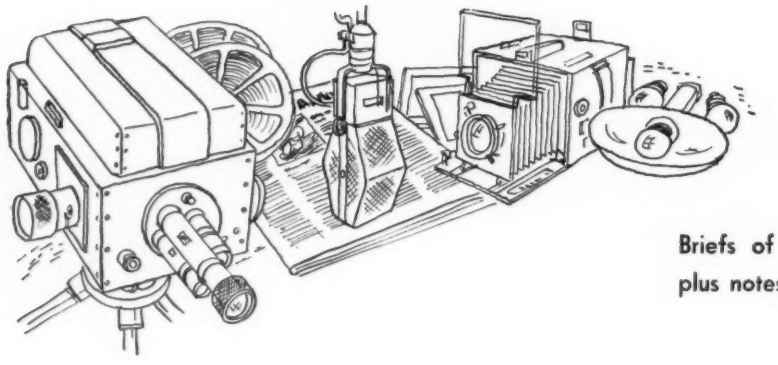
In virtually any engineering problem, the engineer must find an optimum result. This requires the balancing of two or more factors that tend to conflict or to go in opposite directions. For example, one frequently must balance operating costs against fixed charges. Naturally, we would like to make the operating costs as small as possible; this may require an exceptionally expensive plant with correspondingly high fixed charges. Naturally also, we would like to reduce the fixed charges as much as possible by reducing the cost of the plant, but this increases the operating costs.

If we were to adopt the "legal" approach, we would ask, "Which is better—an extremely expensive plant with very low operating costs or an extremely inexpensive plant with very high operating expenses?" We would be thinking in black-and-white terms. Instead, the engineering approach reconciles the two conflicting tendencies and finds the optimum result within the middle-ground.

Engineers solve problems instead of debating them. They don't choose up sides, but instead adopt an "impartial" or "unbiased" attitude toward the conflicting tendencies. They then find out how to give the greatest effect to each in order to obtain the best result. This logical reasoning—which is so automatic to engineers — is the highest type of thinking which has as yet been developed. It is something of which engineers would rightly be proud if they realized what they were doing.

Engineering Approach

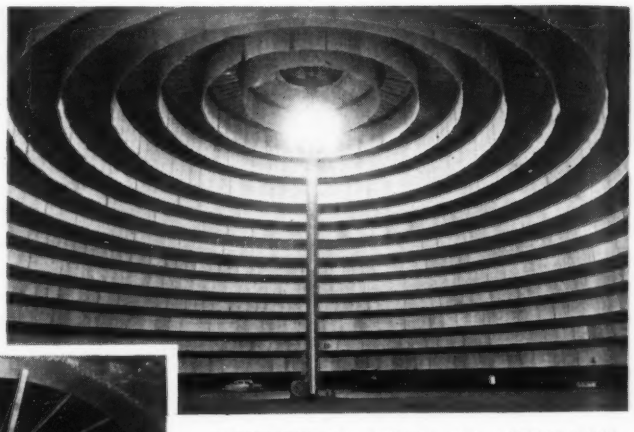
While the "engineering" approach can have great utility in law, this should not make the engineers too smug. True, lawyers fail to use this approach to social problems, but so do the engineers! When an engineer faces a social problem, he flounders around in exactly the same way as anyone else. He arbitrarily chooses one side or the other and indulges his prejudices. If anything, his attitude is even more provoking, since the combination of his ignorance (of social problems) and his self-confidence (based on his success in solving engineering problems) makes him something of a menace in the arena of ethics and politics. Furthermore, though he knows how to take an objective view and how to reconcile divergent factors to achieve an optimum result, he just does not do so when the problems are outside the field of science. ▲▲



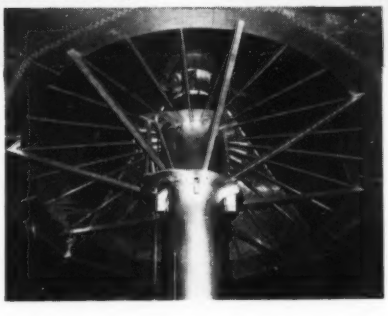
NEWS

Briefs of current interest to the consulting profession plus notes on new equipment in the field of engineering

SEEN FROM THE AIR, THE SEMISPHERE IS ACTUALLY A SEGMENT OF A SPHERE WHICH, IF COMPLETE, WOULD HAVE A RADIUS OF 173.2 FT. THE WALL AT BOTTOM EDGE OF DOME MAKES A 60-DEGREE ANGLE WITH GROUND LEVEL.



CONCENTRIC RINGS OF ACOUSTICAL MATERIAL ARE SUSPENDED FROM THE WALLS FOR SOUND CONTROL. CENTER: THROUGH SPOKES OF PEAK STRUCTURE IS SEEN UNDERSIDE OF ALUMINUM HOOD THAT CONTROLS VENTILATION.



Fast, Safe Erection Is Handled At Ground Level

Putting the LeTourneau Semisphere together is a case of building from the top down, but the building work is all done from the ground.

A necessary preliminary is installation of a steel center pole 94 ft high. The dome begins to grow when a sliding steel collar — called the peak structure — is raised gradually up the center pole, and 15 successive rings of aluminum sheets are bolted on. An electric winch does the raising. Jackstands steady the bottom edge of the partially-constructed dome during the attaching of each new ring of sheets. When the last ring is bolted on, the peak structure is 85 ft up the center pole. The lower edge of the completed building is then lowered and firmly secured to a foundation ring of concrete poured in advance to accommodate the building's circumference.

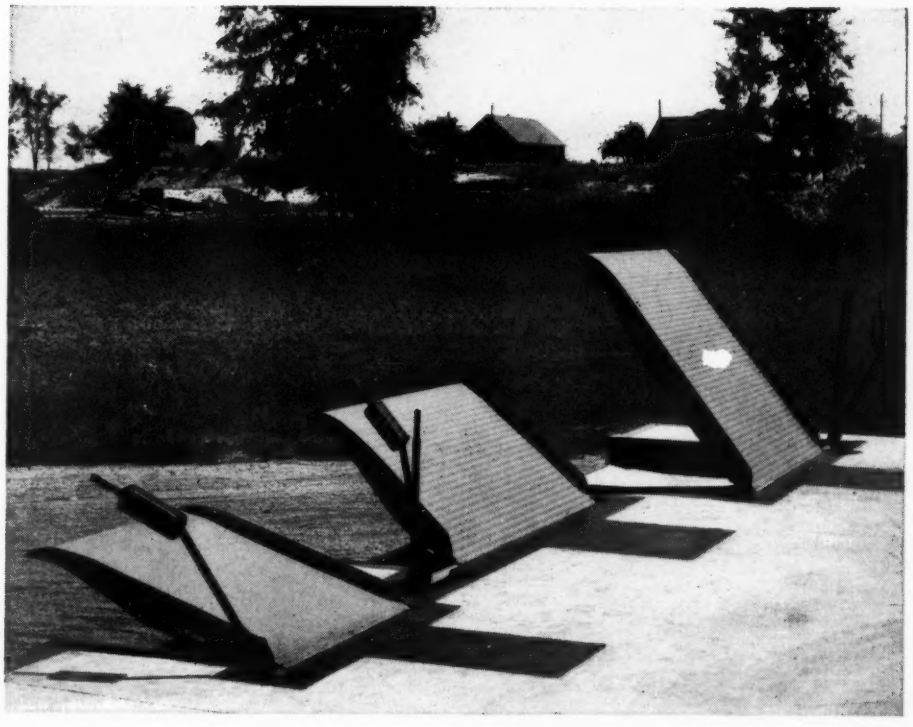
The clear, unobstructed interior makes the building adaptable to many purposes such as warehouses, entertainment or athletic facilities, and assembly line operations. Finishing details and utilities, such as interior surface treatment, lighting, heating, ventilation, air conditioning, acoustics, and floor material can be whatever the building's function calls for. And within certain structural limitations, the size and number of entrances and exits can be varied to suit the end use requirements.

Ventilation of the Semisphere Building is provided by a 255-sq-ft opening through the peak around the center pole. Sheltering of this opening and control of the volume of air passing through it is accomplished by a cone-shaped aluminum hood at the peak of the dome.

The Semisphere, when delivered, consists of the aluminum sheets — curved, embossed, flanged, and drilled — and all other necessary aluminum and steel parts produced to the design specifications of R. G. LeTourneau, Inc. A crew of the company's men supervises erection with the assistance of locally hired labor. Approximately 3000 manhours is the estimated requirement for the actual assembly of the building. ▲▲

DESIGNING A FACTORY? WAREHOUSE? TRUCK TERMINAL?

then it will pay you to include these in your plans...



RITE-HITE ADJUSTABLE LOADING RAMPS

RITE-HITES enable you to utilize space available for loading dock to best advantage. They insure parking of trucks in an orderly manner, providing maximum use of dock approach space and efficient loading and unloading.

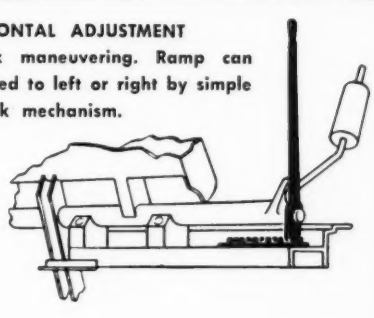
RITE-HITES can be installed singly or in multiples as requirements dictate. Simple mechanical design insures dependable all-weather operations. Little or no maintenance is needed.

RITE-HITES add practically nothing to new-construction costs and can be economically installed in existing loading docks. Detailed installation drawings and instructions are furnished with each unit.

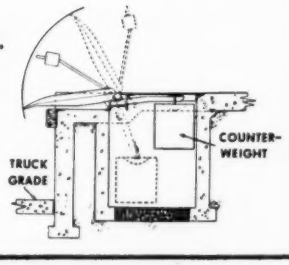
RITE-HITES leave dock edge unobstructed. They can be modified at no extra cost to permit closing overhead doors when ramp is in raised position.

RITE-HITES are available in 3 types, 5 models, capacities: 10,000 and 20,000 pounds. Priced from $395.00.

HORIZONTAL ADJUSTMENT
Reduces truck maneuvering. Ramp can easily be shifted to left or right by simple lever and rack mechanism.



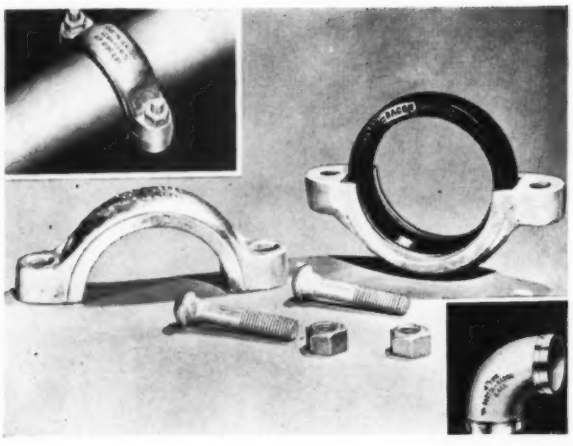
Precision balanced.
Simple design.
No pipes, pumps, gears, motors.



RITE-HITE® DIVISION
LOOMIS MACHINE COMPANY
FOURTH AND PINE STS. • CLARE, MICH.

Get complete installation details and 8-page descriptive bulletin. Write Dept. CE-34

—Starts on page 62



Couplings and Fittings For Grooved Aluminum Pipe

Increased production and use of aluminum pipe have brought about the need for couplings and fittings designed especially for this lighter pipe.

Aluminum Gruvagrips and fittings made by Gustin-Bacon Manufacturing Co. are for grooved, lightweight, high pressure pipe systems. Available in 2, 4, 6, and 8 in. sizes, the eight inch Gruvagrip weighs less than 11½ lb complete.

These couplings automatically absorb expansion and contraction, shock, ground motion, and vibration. They remain leakproof under end pulls up to 46,000 lb; permit layout misalignment up to 3 deg; and withstand temperatures between 200 and –65 F. They can be removed and re-used repeatedly. Suitable for permanent or temporary lines carrying air, vacuum, gases, water, oil, and chemicals, the couplings have a sealing gasket of resilient synthetic rubber designed to resist the deteriorating effects of oil and chemicals.

Fittings are machined to standard grooving dimensions. They are 100 percent reclaimable; the fittings come in 90 deg elbows, 45 deg elbows, tees, caps, and nipples.

Complete information may be obtained from the manufacturer, Gustin-Bacon Manufacturing Company, 210 West Tenth St., Kansas City 6, Mo. ▲▲

Automation is Necessary For Industrial Progress

"If industry is to continue to make the type of progress that has raised our standard of living so much over the past two or three decades, it must plan on more and more automation in production lines," G. H. Gustat, superintendent, Industrial Engineering Division, Eastman Kodak Company, told members of the ASME attending their annual convention in New York City.

He warned that lower costs and greater production volumes will depend on "How good and timely the judgment is that fosters changes to automation. At present, he said, some manufacturing processes or operations are automatically controlled.

"Top management personnel must continue to have the faith to invest, often huge sums of money, in new and improved equipment that will produce more and more wealth which in turn raises our standard of living and provides continuing employment for greater numbers of people."

He went on to say that the burden of timing changes of this kind to prevent displacing labor by absorbing them in increasing production schedules falls upon management.

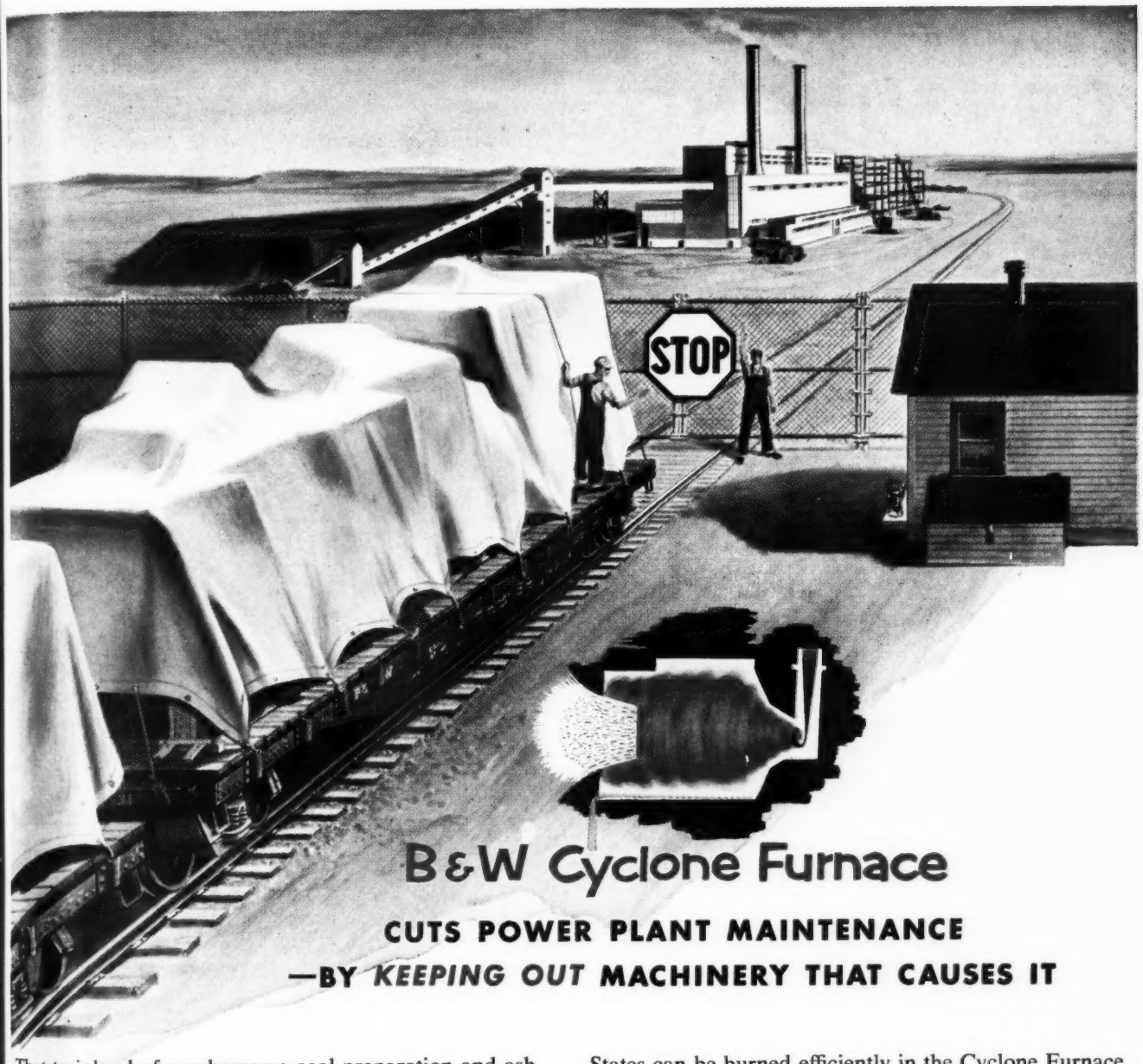
The current shortage of young engineers is creating a problem for both supervision and top management according to Mr. Gustat, because it is this type of labor that helps to design, install, and maintain automatic equipment, but that it must not be construed that engineers alone will do the job. Rather, automation emphasizes the importance of supervision, technical men, operators, and staff department personnel working as a team. ▲▲

Quiet and Efficient Fans

Operating at efficiencies over 90 percent, Type A airfoil centrifugal fans feature blades which conform to the same aerodynamic principles used on modern aircraft to provide the greatest volume of air at low noise level.

The wheel is of the backward curve type with airfoil hollow sectional blades. Steep pressure characteristic curve of the fan is said to make it particularly suitable for all of today's high pressure air conditioning systems, either induced or forced draft applications.

Of class 1 to 5 construction, fan delivers 600 to 750,000 cfm, ⅛ to 32 in. static pressures. Wheels are 12 to 123 in. in dia. The manufacturer is Chicago



B&W Cyclone Furnace

CUTS POWER PLANT MAINTENANCE —BY *KEEPING OUT* MACHINERY THAT CAUSES IT

That trainload of cumbersome coal preparation and ash handling machinery represents a heavy, endless load of costs for many coal-burning power plants. The constant attention and maintenance required by coal pulverizers, with their motors and controls; burners and piping; cumbersome hot-air ducts, fly-ash precipitators and ash collection and disposal systems . . . all add up to expense that can now be eliminated.

Burning coal that is merely crushed, the B&W Cyclone Furnace makes possible substantial savings in maintenance through elimination of much of the coal preparation equipment. And the Cyclone burns coal in such a way as to keep the resulting ash *out* of the boiler and stack . . . converting it into easy-to-handle, easy-to-dispose-of slag . . . thus simplifying or eliminating a considerable share of the ash precipitating, collecting, handling and disposal system.

The Cyclone Furnace offers many other advantages . . . higher combustion efficiency, easier conversion to gas and oil, savings in first cost, increased safety, and simplified arrangement for remote-control operation.

A high percentage of all bituminous coals in the United States can be burned efficiently in the Cyclone Furnace. It can handle a wide variety of coal from mines in all parts of the country. Regardless of where a coal-burning plant may be located, it will have an excellent competitive market in which to purchase coal suitable for firing in the Cyclone Furnace.

Substantial dollars-and-cents benefits are being enjoyed by owners of the many boilers fired with Cyclone Furnaces which are now in operation—under a great variety of conditions—in different parts of the country. Based on this intensive, long-range experience, we will be pleased to discuss with you the many advantages the Cyclone Furnace offers.

The Babcock & Wilcox Company, Boiler Division,
161 East 42nd Street, New York 17, N. Y.

BABCOCK & WILCOX
BOILER DIVISION

N-170

To all CONSULTING ENGINEERS who specify REGULATING EQUIPMENT

Fig. 1

For more than a half century it has been the business of the Atlas Valve Company to specialize *exclusively* in the design and manufacture of regulating devices.

Here we show five typical examples. Fig. 1 is a self-contained temperature regulator for steam pressures to 300 p. s. i. and controlled temperatures from 60 to 300 deg. F. Will shut off dead tight and hold set temperature accurately.

Fig. 4

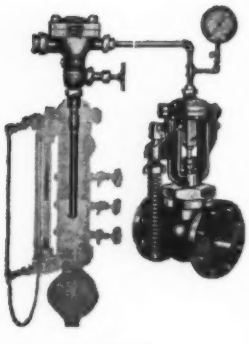


Fig. 2

Fig. 2 shows the CAMPBELL Boiler Feed Regulator. No floats. No thermostats. No generators. For any boiler with pressures from 50 to 400 p.s.i. Simple. Fool-proof principle of operation.

Fig. 3 shows a Damper Regulator for medium pressure boilers. We also make them for low pressure heating boilers and for high pressure boilers.

Fig. 4 shows a High Pressure Reducing Valve. Reduces pressures as high as 6,000 p.s.i. down to as low as 100 p.s.i. without shock. Excellent for hydraulic presses.

Fig. 5 shows our Type "B" Reducing Valve for initial pressures to 900 p.s.i. and reduced pressures as low as ½ p.s.i. Pilot valve solid STELLITE. Pilot valve seat STELLITE faced.

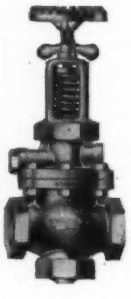


Fig. 5

ASK FOR LITERATURE.

Fig. 3

We shall be glad to have you ask for literature covering the above and other ATLAS Regulating Devices. Check the items below that interest you, clip out, and mail to us with your name and address.

ATLAS VALVE COMPANY

REGULATING VALVES FOR EVERY SERVICE

259 South St. **Newark 5, N. J.**

Represented in Principal Cities

- ☐ Back Pressure Valves
- ☐ Balanced Valves
- ☐ Boiler Feed Regulators
- ☐ Control Valves
- ☐ Damper Regulators
- ☐ Exhaust Control System
- ☐ Float Valves
- ☐ Oil Control Cocks
- ☐ Temperature Regulators
- ☐ Pressure Regulators
- ☐ Pump Governors
- ☐ Reducing Valves

Efficient Fans

—Starts on page 64

Blower Corporation, 9867 Pacific Avenue, Franklin Park, Illinois. ▲▲

Carbon-Bonded Spouts Last Three to Four Days

Carbon-bonded silicon carbide pouring spouts developed for a new western copper refinery are helping to maintain continuous 24-hr per day production of horizontal cast copper wirebars.

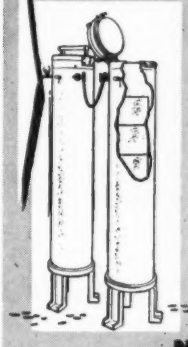
Conventional refractory spouts require constant repairs to obtain a life of 24-hr. The new spouts developed by engineers of the copper company and Electro Refractories & Abrasives Corp. last from three to four days of continuous service during which time little repair work is required.

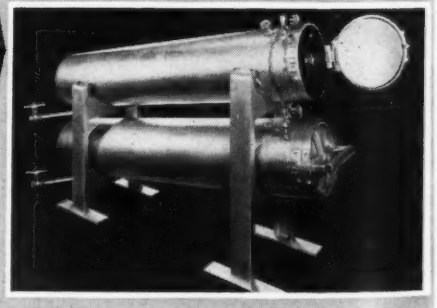
They resist the wetting action of the cuprous oxide present in molten tough pitch copper, thus preventing metal or slag penetration and the resultant destruction of the refractory. The spouts maintain their original size so that four individual streams of molten copper may be delivered into individual molds at a definite and uniform rate of flow. Due to the lower thermal conductivity of the

—Continued on page 71

for PURGING...

DRY ICE CONVERTERS





NO OPERATING COSTS!

Dry Ice Converters are A.S.M.E. code pressure vessels especially adapted for charging full-sized 50-lb. cakes of solid CO_2. They may be located any place in a plant and connected by pressure piping to the gas use area. A variety of sizes are available for either vertical or horizontal installation. No electricity, fuel or refrigeration needed.

Write for folder and prices

DRY ICE CONVERTER CORP. TULSA, OKLAHOMA

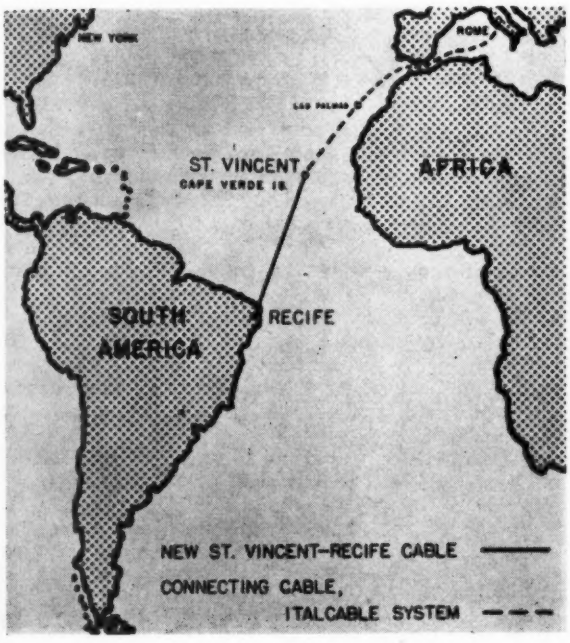
DRY ICE CONVERTER CORPORATION

Dept. C., Box 1652, Tulsa, Okla.

Spouts Last Longer

—*Starts on page 66*

carbon-bonded silicon carbide no external heat is required to maintain the temperature of the ladle spouts between pours. External heat was essential when spouts were made of silicon carbide but not carbon bonded. ▲▲



Polyethylene-Insulated Cable Links Italy and South America

The longest single polyethylene-insulated cable ever laid now links Europe with South America across the South Atlantic. Because of the low dielectric constant of polyethylene, a smaller cable is possible which, in turn, leads to a reduction in over-all weight and a ⅓ reduction in cost.

Replacing a section of cable lost during World War II, the new link restores direct telegraph service between Italy and South America. Four cable manufacturers in England, France, Germany, and Italy produced more than 1750 miles of this cable insulated for the most part with polyethylene supplied by Bakelite Company, a Division of Union Carbide and Carbon Corp.

Only one inch in diameter, the cable, which lies on the ocean floor more than 3½ miles deep at some points, was completely laid in about one month. ▲▲

Convention Plans Are Complete For Ohio Section of NSPE

The highly controversial St. Lawrence Seaway Project will be discussed by Major General Samuel D. Sturgis, Jr., Chief of the U. S. Army Corps of

—*Continued on page 84*

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Lubricating and Industrial
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A complete line of equipment for filtering, purifying and reclaiming oil from Diesel Engines, steam turbines, steam engines, air and gas compressors, vacuum pumps, transformers, circuit breakers, wire drawing machines, metal rolling mills, paper machinery heat treating, hydraulic equipment and in fact from practically any equipment in which oil is used.

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HILCO units are available for continuous or batch operation to keep lubricating and industrial oils clean and recover large quantities of oil at low cost.

Wherever oil is used it becomes contaminated—must be discarded or conditioned for further use.

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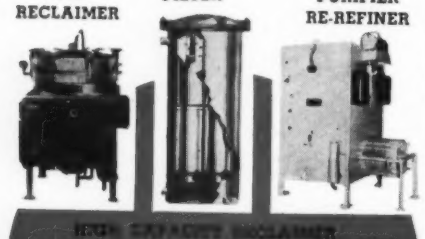
CLEAN OIL REDUCES DOWN TIME
INCREASES PRODUCTION

OIL RECLAIMER | FILTER | PURIFIER RE-REFINER



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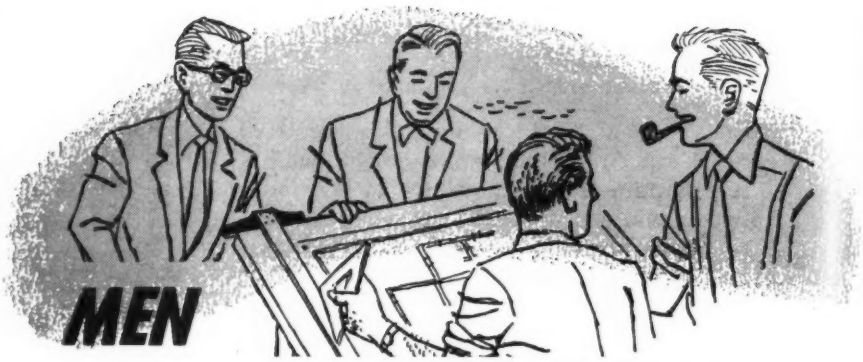

MEN IN ENGINEERING

★ Mars Engineering, Inc. adds a new division which will design industrial dust collection and fume elimination systems, according to Albert C. Tess, president.

★ Perkin-Elmer Corp. announces the opening of its new Midwest sales and service office at 230 N. Michigan Ave., Chicago, headed by John H. Rhodes.

★ Architects for the $3½ million National Cylinder Gas Co. plant in Chicago will be Olsen and Urbain, General contractors are Campbell-Lowrie-Lautermilch Corp.

★ Appointment of George G. Halfinger as manager of the Ohio Valley Electric Corporation's Kyger Creek Plant, now under construction, is announced.

★ Raymond L. Johnson, formerly an engineer for the Public Service Electric and Gas Co., Newark, New Jersey, joins the Instrument Div. of Allen B. Du Mont Laboratories, Inc. as technical sales engineer.

★ Contract for the mechanical design, engineering, construction, and material procurement of a 29,000 barrel-per-day platforming unit for the Gulf Oil Corp. at Port Arthur, Texas, is awarded to the Fluor Corp., Ltd. Fluor will also engineer and construct an ammonia plant expansion for Dow Chemical Co. of Canada, Ltd. Engineering will be handled by Fluor associate H. G. Acres & Co., Ltd.

★ Dravo Corp. announces that its Atlanta, Ga. office, under supervision of William W. Timmis, Jr., has been moved to Room 361, 1401 Peachtree St., N. E. Wheeler M. Bearden, formerly of the Pittsburgh office, will join the Atlanta staff.

★ Establishment of engineering scholarships, open to young men of Southern Calif., is announced by James T. Holmes, president, and D. Lee Narver, executive vice president, of Holmes & Narver, Inc., Los Angeles. Funds provide a grant of $10,000 for four years at MIT and $8000 for a similar course of study at Stanford University.

★ Dr. Robert H. Eustis, formerly chief engineer of the Thermal Research and Engineering Corp. joins the physics staff of Stanford Research Institute, heat and mechanics section.

★ Architecture and planning for the Mile High Center office building in Denver are under the direction of I. M. Pei of Webb & Knapp, Inc. General contractor is the George A. Fuller Co. Seaporcel Metals, Inc.

General mgr. J. S. Parker of General Electric's new Small Aircraft Engine Dept. and his staff inspect a mock-up model of the small gas turbine engine (XT-58) GE is developing for the Navy. Left to right are: L. I. Asher, mgr. of finance; L. T. Callahan, mgr. of mfg.; J. P. Turner, Jr., mgr. of marketing; Parker E. Woll, mgr. of engineering; and H. T. Hokanson, mgr. of Project XT-58.

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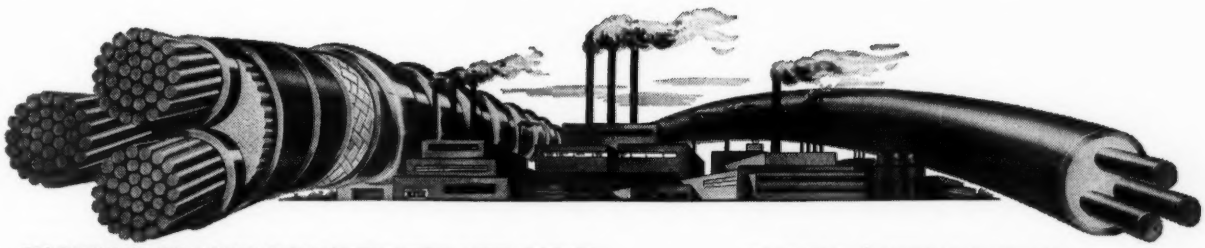
POWER TWINS

...Newest, Most Practical Team for Plant and Equipment Wiring



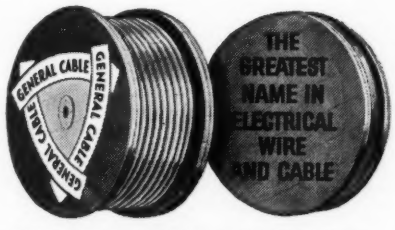
VARNISHED CAMBRIC OR RUBBER INSULATED CABLES

SAFETY m.i. WIRING SYSTEMS

The famous Power Twins combine lower installed costs with unique adaptability. They are ideal for electrical wiring without conduit in close areas and under, down and around beams and pillars...where power needs vary... where plant layout presents difficulties.

Varnished Cambric or Rubber Interlocked Armor Cable is designed for both low and high voltage requirements, (lighting and power control) and is available with steel, bronze or aluminum armor.

Safety m.i. Wiring System, all mineral insulated and exclusive with General Cable, is ideal for all applications up to 600 v. where heat, vapors, moisture, aging are of particular concern. Lower installed cost! Small diameter saves space! Trains easily for neat, compact installation. Investigate this popular combination before you buy. They can save you time and money.



BARE, WEATHERPROOF, INSULATED WIRES and CABLES FOR EVERY ELECTRICAL PURPOSE

GENERAL CABLE CORPORATION

420 Lexington Avenue, New York 17, New York • Sales Offices: Atlanta • Buffalo Cambridge (Mass.) • Chicago • Cleveland • Dallas • Detroit • Greensboro, N. C. • Indianapolis • Kansas City • Los Angeles • Milwaukee • Houston Minneapolis • Newark (N. J.) • New York • Philadelphia • Pittsburgh Portland (Ore.) • Rossmoyne, Ohio (Cincinnati area) • St. Louis • San Francisco • Seattle • Syracuse • Tulsa • Washington, D. C.

Where a Job Well Done JOINS HANDS...

The veteran RIC-WIL field supervisor and contractor join hands in a JOB WELL DONE. Expert field service is available on all RIC-WIL installations.

There is satisfaction in achievement . . . the knowledge that *BOTH* the supplier and the buyer have given their best . . . and the best in Prefabricated Insulated Piping for underground and overhead systems is RIC-WIL.

The next time you specify . . . specify Quality . . . specify RIC-WIL.
Write direct for Catalog No. 5401 or contact your local RIC-WIL representative.

RIC-WIL
Multiple Systems

Send for Catalog No. 5401

Quality Piping Systems of the . . .
. . . Highest Mechanical Strength

RIC-WIL PREFABRICATED INSULATED PIPING SYSTEMS

THE RIC-WIL COMPANY
BARBERTON, OHIO

MEN

—*Starts on page 72*

will provide material for a plush porcelain penthouse that will top the building.

★ John F. O'Connell, vp, Bechtel Corp. is elected president of the National Constructors Association. J. H. Sharpe, Arthur G. McKee & Co., was elected vp of the organization. Other members of the Executive Committee include: E. R. McGonnigle, The M. W. Kellogg Co.; C. C. Whittelsey, Ford, Bacon & Davis Construction Corp.; T. C. Williams, Stone & Webster Engineering Corp.; W. R. Wood, The Girdler Co.; L. C. Reynolds, C. F. Braun & Co.

★ KSM Products, Inc. names H. L. Wagener as special consultant to its technical research group to guide in developing new materials and processes in stud welding.

WAGENER ROSENDAHL

★ Van W. Rosendahl joins Rosendahl Corp. as chairman of the board. He will make his headquarters in recently established offices at 100 Bush St., San Francisco.

★ John W. James, vice president in charge of research for McDonnell & Miller, Inc., is elected second vice president of American Society of Heating and Ventilating Engineers.

★ Robert J. Strass, Professional Engineer, announces that Harry A. Loser is now affiliated with his staff.

★ Curtis H. Barker, Jr. joins John L. Schwab & Associates as director of materials handling activities.

★ Joining the firm Designers for Industry, Inc. are Frank L. Eger as senior field investigator, and Dante J. Domizi as senior project designer, electronics engineering. Promotions include Philip N. Bredesen to assistant project manager, electronics; Guilbert M. Hunt to industrial designer, mechanical; Alfred L. Lea to project engineer, mechanical; Roger L. Chaloupka and James V. Westberg to project designers, mechanical; Hiram G. Gilbert, Edward Holasek, Edward F. Mazur, and George J. Prusha to

What's the temperature of the basin water?

84°— just what MARLEY said it would be

Thermal control dictates the economy of every process operation, and the key to control is cold water — delivered consistently at design specification. Every Marley cooling tower offered today will produce that optimum result.

Built into every Marley tower is the pretested performance ability to do its specified job (or more) day-after-day, year-in-year-out. This is the result of 30 years of constant research and development; the result of 10,000 separate installations of Marley mechanical draft cooling towers. Today Marley has positive performance data for every tower for any location and Marley backs its knowledge with an equally positive guarantee.

Test after test have proved the efficiency of Marley rating methods. These tests have been conducted according to procedure specified by all accepted test codes. The Marley tower you purchase is subject to the same complete test after installation.

"Calculating Cooling Tower Performance from Test Data," a new Marley brochure explaining a simplified method of analyzing the actual performance of any type mechanical draft cooling tower will be available soon. May we have your name for an advance copy?

The Marley Company

Kansas City, Missouri

MARLEY

tolls take less time
in busy New England with
TALLER & COOPER equipment

Taller & Cooper toll collection installations keep traffic flowing smoothly across this busy bridge.

Here, and at every other major toll facility in America, Taller & Cooper custom-designed toll collection equipment guarantees accuracy, dependability, and speed of collection.

Taller & Cooper manufactures integrated toll collection systems combining the most advanced collection equipment with all-steel fabricated Booths and Canopies. They are weather-proof, attractive, and completely *safe* for money and for personnel.

Write today for design and construction details.

Taller & Cooper toll collection equipment at Charter Oak Bridge, Hartford, Connecticut

TALLER & COOPER, INC.

ENGINEERS • MANUFACTURERS

58 WASHINGTON STREET • BROOKLYN 1, N. Y.

TALLER & COOPER TOLL COLLECTION EQUIPMENT IS USED ON EVERY MAJOR TOLL FACILITY IN THE U. S.

TOLL BOOTHS

TOLL COLLECTION SYSTEMS

MEN

—*Starts on page 72*

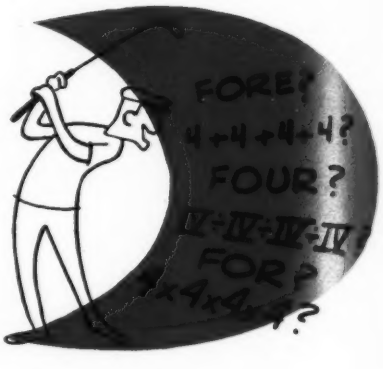
project designers, electronics; and Donald P. Berg to senior project designer, mechanical. Andrew M. Filak is transferred to the sales dept.

Patrick E. Lannan, assistant project manager on the electronics staff has been awarded Senior Membership, Institute of Radio Engineers.

★ Appointment of Joseph Grissom, Jr. as manager of southern sales is announced by the Benjamin F. Shaw Co.

★ Walter Kidde Constructors, Inc. is awarded a contract to design and build a new plant for the Permatex Co. at Kansas City, Mo. To cost about $500,000 the project will consist of an air-conditioned plant of modern design with a two-level manufacturing area utilizing gravity to minimize pumping of compounded materials.

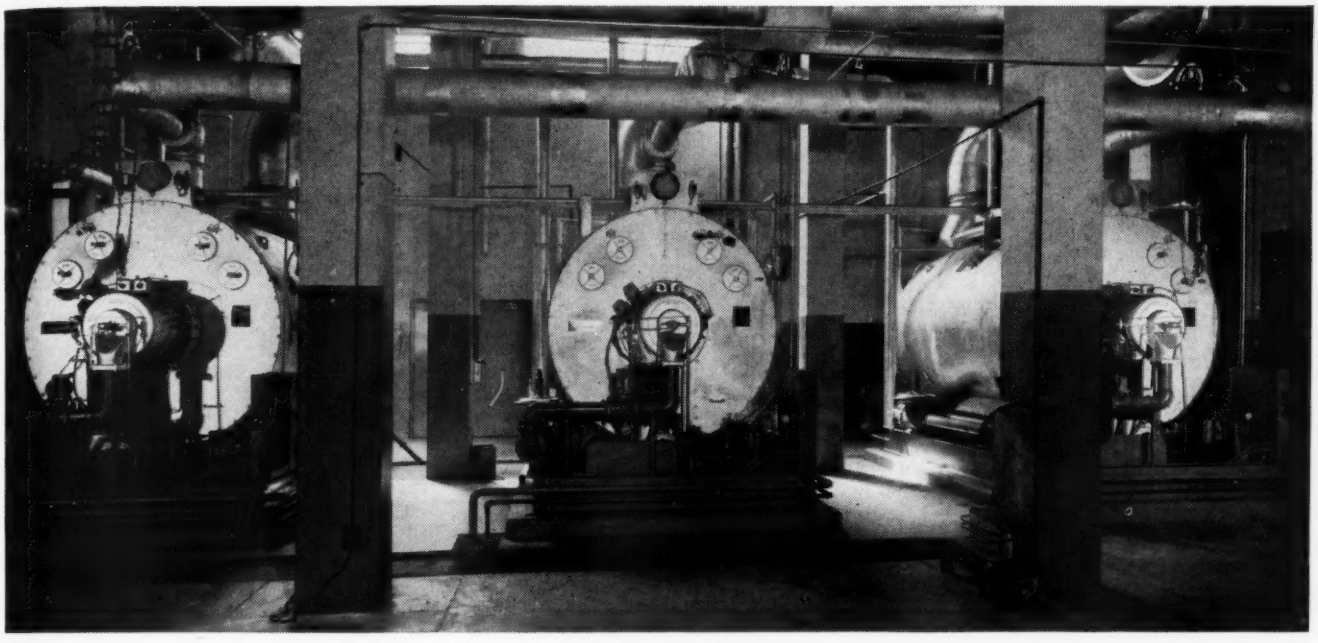
★ Recipients of the Stevens Institute of Technology Honor Award Medallion for 1953 are Ralph J. Cordiner, president of General Electric Co.; Richard H. DeMott, chairman of the board and president



How would you algebraically combine the digit "7" four times so as to produce the number 56? And how would you variously combine the digit "4" four times to successively produce each of the numbers from 1 to 30 (such as $(4 + 4)\ 4 \div 4 = 8$)?

Answers on page 78

IN ALL TYPES OF BUILDINGS



This installation was made by Continental Engineers, Inc., mechanical contractors, of Atlanta. Gas is supplied by Atlanta Gas Light Company.

Powermaster® Efficiency Pays Off

For example: Only $1.15 per month per apartment average fuel costs the year around for Heating, Hot Water and Air Conditioning for 535 apartments in Howell House at Atlanta, Ga.

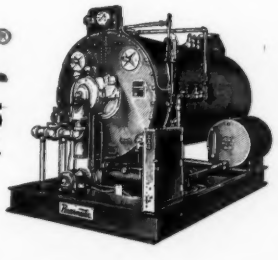
These services in this new modern building are supplied by three *Powermaster* Packaged Automatic Boilers at this amazingly low cost for gas and oil fuel. Providing year-round services with the boilers result in maximum operating economy. Yet fuel saving is only one reason *Powermaster* is so popular with those who select, install and operate boilers for all types of buildings—offices, hotels, institutions, churches, housing projects, etc. Cost-saving installation, space-saving compactness, fast steaming, hospital-clean operation, dependability, maintenance-saving accessibility, fully automatic operating and safety controls, and smokeless combustion are others. Compare *Powermaster* with any other packaged automatic boiler and you'll see why it is today's best buy for schools, industrial plants, laundries, and other requirements as well as for all types of buildings. Send for latest descriptive bulletin.

O&S

Powermaster®

PACKAGED AUTOMATIC BOILERS

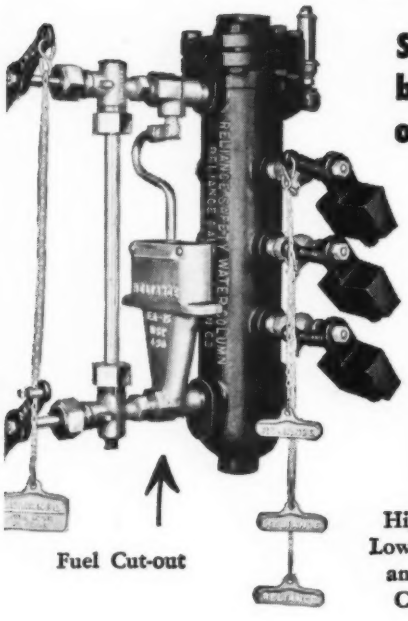
In sizes to 500 HP; pressures to 250 psi.



ORR & SEMBOWER, INC. • Established 1885 • **Morgantown Road, Reading, Penna.**

New Reliance Levalarms

. . . simple, safe, sure controls for audible and visible water level alarms and fuel cut-out



Fuel Cut-out

Simple, rugged—unaffected by pressure, temperature or water conditions

High and Low Alarms and Fuel Cut-out

Using isolated circuits of low amperage, the new electrode-type Reliance Levalarms avoid troubles usually encountered with water level alarm and fuel cut-out devices. Without bellows or stuffing boxes; without vacuum tubes or magnets, these controls take their commands direct from the boiler water itself as it rises or falls in the water column.

One style adds the facility of a positive fuel cut-out control to float-operated whistle alarm columns. Other models provide high and low alarm *and* fuel cut-out facilities, and pump cut-in and cut-out if desired. In some instances the new Levalarms can be added to water columns already in service. Their installation is easy for any engineer. Write today for Bulletin D2 covering Electrode-type Levalarms.

THE RELIANCE GAUGE COLUMN COMPANY
5902 Carnegie Avenue • Cleveland 3, Ohio

The name that introduced safety water columns....in 1884

Reliance®

BOILER SAFETY DEVICES

MEN

—*Starts on page 72*

of SKF Industries, Inc.; and James L. Myers, chairman of the board and president of Clevite Corp.

★ Arthur E. Rowe and Associates will be architectural engineers for the new plant addition at the Ashtabula Div. of Reliance Electric and Engineering Co. in Ohio according to J. W. Corey, pres. of Reliance.

★ Appointment of Richard H. McCarthy as sales engineer for the Dallas area is announced by the Heavy Machinery Div. of Nordberg Manufacturing Co.

★ Joining the staff of Lockwood Greene Engineers, Inc. as project manager, Samuel B. Roberts will direct layout and design of major industrial operations.

★ Dr. Warren C. Lothrop is appointed a vice president of Arthur D. Little, Inc. in charge of the research and development division. This division will be housed in the new 60,000 sq ft laboratory being completed in West Cambridge, Mass.

HARTRIDGE KOSTERS BARRY

★ Alfred L. Hartridge and Stuart F. Kosters are elected vice presidents, and Thomas W. Barry appointed an assistant treasurer of Stone & Webster Engineering Corp.

★ Following merger of Wallace & Tiernan Co., Inc. with Novadel-Agene Corp. to form Wallace & Tiernan, Inc., F. G. Merckel is elected president; R. M. Jackson, executive vice president and treasurer; and G. D. Peet, vice president, product engineering and development.

Figurenometry Answers

$[\,(7 \div 7) + 7] \times 7 = 56$

$\dfrac{4 + 4}{4 + 4} = 1$

$(4 \div 4) + (4 \div 4) = 2$

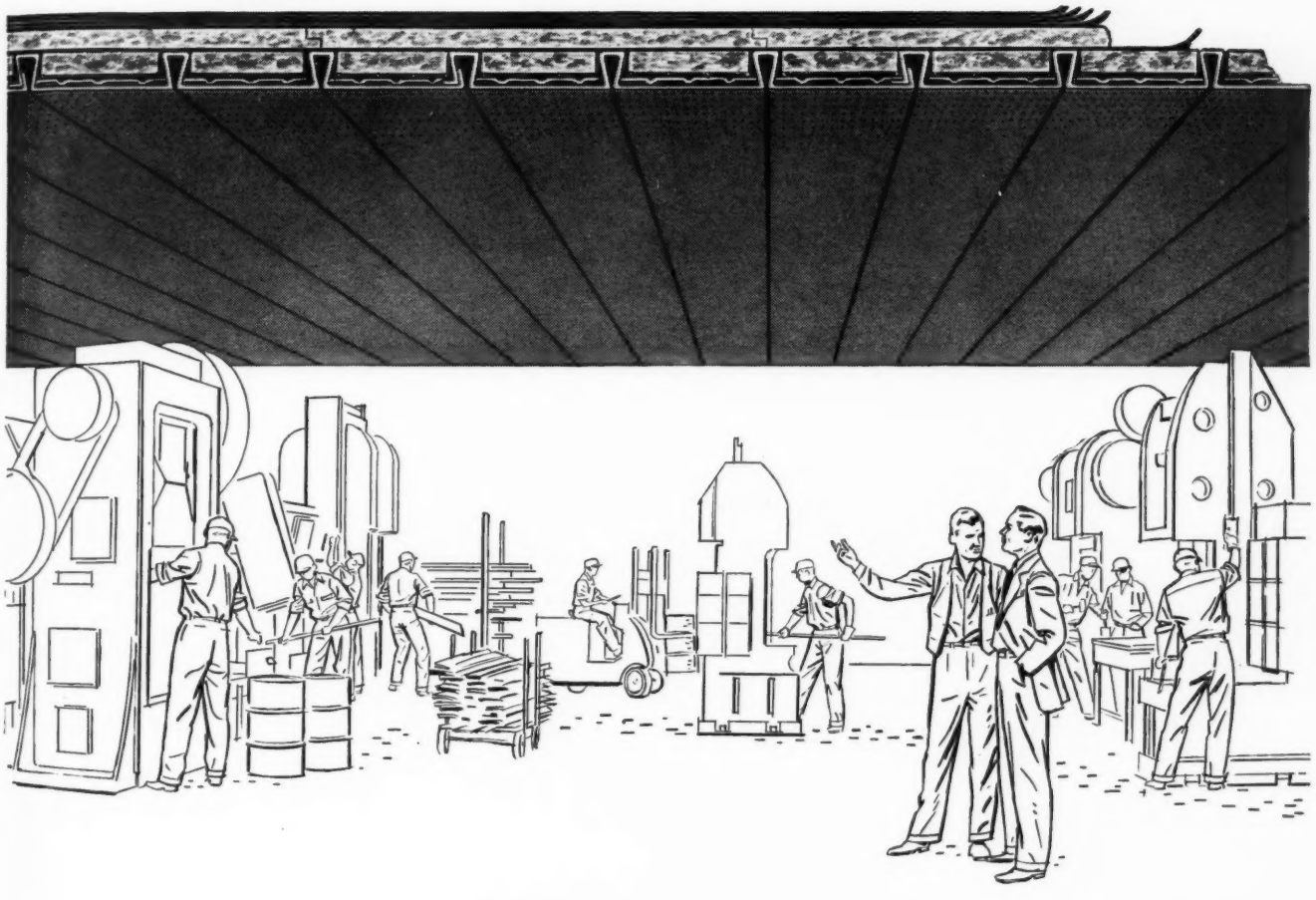
$(4 + 4 + 4) \div 4 = 3$

$\sqrt{(4 \times 4) \times (4 \div 4)} = 4$

and so on.

Fenestra 50 YEARS OF BUILDING PRODUCT LEADERSHIP

*"A salute to those who made it possible"**



SILENCE IS REALLY GOLDEN . . . HERE!

Noise, NOISE, NOISE. Nagging, hammering, screeching, deafening. In plant after plant, workers complain, work lags, men stay home until their heads stop ringing. Industrial noise causes a reported *$4,000,000*-a-day loss in worker efficiency.

But there's an answer—in a new *Fenestra** building idea: A combination acoustical-structural roof that costs as little as 75 cents per square foot . . . installed.

In one compact unit you get: (1) perforated light-gauge Fenestra Holorib Steel Deck which provides a smooth-finished, metal-faced interior ceiling; (2) sound-absorbing element which is also efficient heat insulation; (3) strong steel surface for support of wood fiber insulation and finished roofing.

Holorib is lightweight. It saves you building time, labor, materials and money. It's practically maintenance free. But you *can* wash it or paint it time and time again without hurting its acoustical efficiency a bit. And, it's *noncombustible!*

General Motors Technical Center, Warren, Michigan; Standard Pressed Steel Company, Jenkintown, Pa.; Simmons Saw & File Company, Fitchburg, Massachusetts . . . these are just a few of the companies taking advantage of this great Fenestra development.

Write us for complete information—or have your architect write—and check on Fenestra floor panels and wall panels. Fenestra Metal Building Panels speed building and cut costs because they are a multi-purpose building material. Write Detroit Steel Products Company, Dept. CE 3, 3443 Griffin Street, Detroit 11, Michigan.

*Trademark

* Your need for a practical way to make a factory quieter encouraged us to develop Fenestra Acoustical Holorib.

Fenestra | METAL BUILDING PANELS

Isolated Phase Bus

—*Starts on page 34*

conductor were protected by wood strapped around the conductor. The insulators and inside covers were kept clean by protective covers of paper. Each section, weighing 4400 pounds, was lifted into place, and aligned. The connectors were then installed, inspected, and covered.

Indoors, the space for handling and installation of isolated phase bus was limited. Here the bus was broken down into smaller components to facilitate its installation.

Elimination of gaskets in outdoor equipment has always been desirable. None of the three-phase, factory-assembled sections has gaskets. The covers of these sections consist of 26-inch, I.D., seam-welded aluminum. The covers in turn are welded to the aluminum supporting rings. The only cover and ring gaskets used are those between each welded three-phase section.

The inductive heating of the adjacent building steel was carefully investigated. Since this was an existing building, the basic idea of supporting the bus was to provide two stringer H-beams running the length of the bus. On the roof, these beams were supported by extending supports through the roof to the building steel. On the sides of the buildings, the beams were fastened to the walls by means of anchors. Shading bands placed directly under the conductors protected the H-beams holding the supporting rings. The ends of these H-beams were insulated from the runner beams. Loops of steel close to and parallel to the conductors were broken up by insulation when necessary. Amortisseur grids were installed between the conductors and the steel in the building walls in some cases.

The total extended single-phase footages of isolated phase bus installed at this station is as follows:

800	feet	—	2000 amperes
192	feet	—	3000 amperes
4825	feet	—	4000 amperes
267	feet	—	5000 amperes
2637	feet	—	7000 amperes
8721	feet	—	Total

United Engineers and Constructors, Inc. were the contractors for the erection of this new generating station for units 7 and 8. ▲▲

Two-Way Radio

—*Starts on page 44*

call. At best, he had to wait until a member of the crew called in before he could make another assignment, even in an emergency.

The crew had its difficulties, too. Telephones are sometimes hard to find outside the city where a good part of the utility's facilities are located. Crews often sat idle while a member searched for a telephone.

The power company had to be ready to cope with emergencies. Because units were unavailable to the dispatcher once they left the garage, some had to be kept back on a standby basis. A crew on standby draws pay, but does no work. If no emergency occurs, its time is wasted.

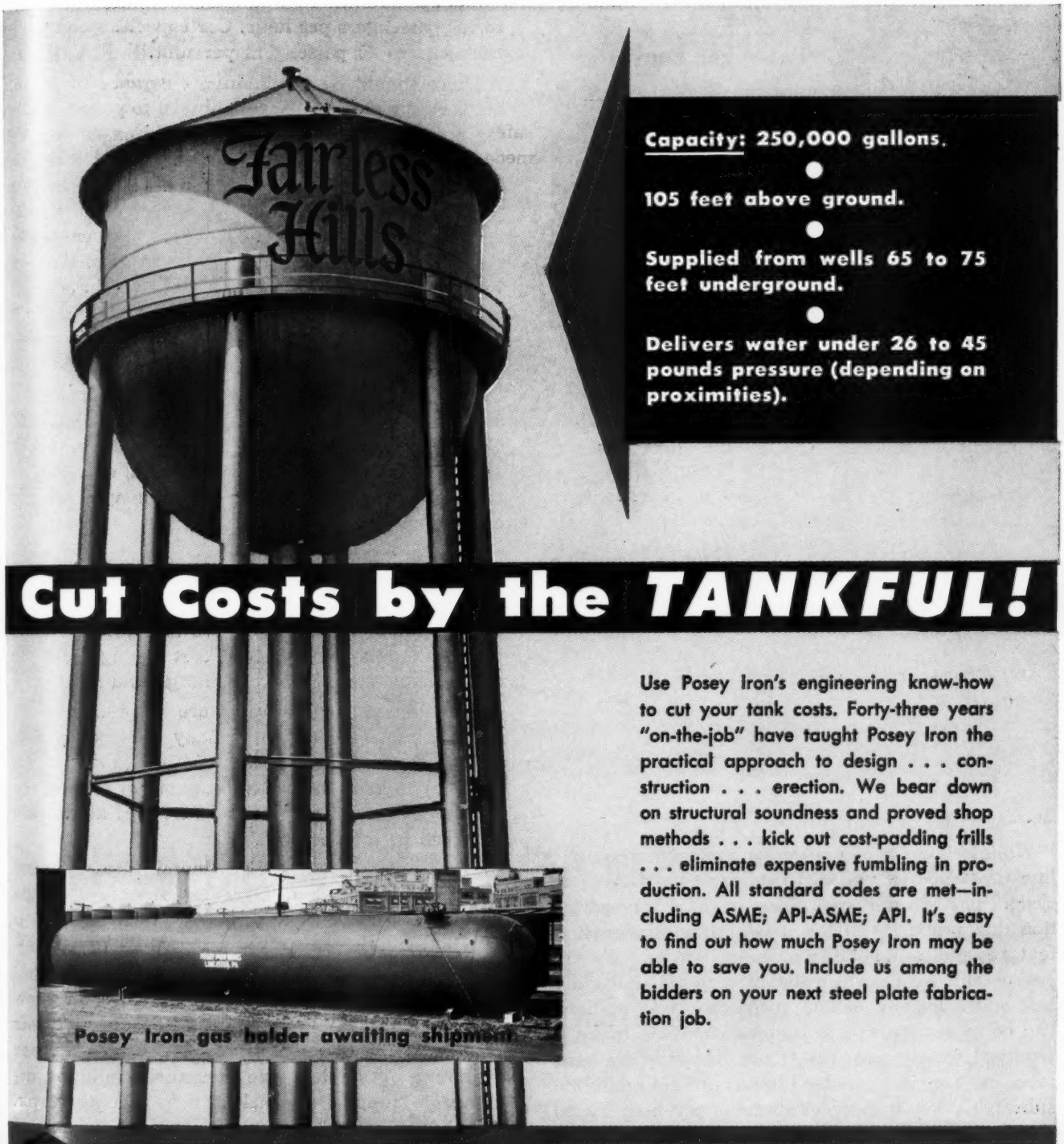
When an emergency did occur, it was quite possible that the dispatched truck might travel miles to a point which was within two or three blocks of a similar truck capable of handling the situation but beyond the reach of the dispatcher.

Still another consideration was manpower. Skilled men are hard to find. Men working within a radio-coordinated system work more effectively. Four crews with radio do the work of five without radio.

A final factor was the possible elimination of the telephone system in city-wide emergencies. In the past, during floods and other disasters, the telephone lines have been overloaded, a condition that slowed power system reconstruction tremendously. Power distribution and telephone service are both dependent upon exceedingly complex webs of wire.

Major disruptions in service due to enemy attack in wartime would tend to occur simultaneously in the two systems. Thus, Duquesne could lose its only means of communication when it was most needed. The loss of power to the community would consequently be prolonged, a condition that would magnify the effects of the disaster. With the two-way radio system installed, communications will be maintained, should such a catastrophe occur.

Years ago, Duquesne Light laid the foundation of its reputation for foresightedness and ingenuity by designing and installing its own supervisory control system, one of the first such systems in existence. That reputation was advanced by the installation of an exceptionally complete two-way radio system. It has been still more enhanced by the addition of a "quik-call" system. ▲▲



Capacity: 250,000 gallons.

●

105 feet above ground.

●

Supplied from wells 65 to 75 feet underground.

●

Delivers water under 26 to 45 pounds pressure (depending on proximities).

Cut Costs by the *TANKFUL!*

Posey Iron gas holder awaiting shipment.

Use Posey Iron's engineering know-how to cut your tank costs. Forty-three years "on-the-job" have taught Posey Iron the practical approach to design . . . construction . . . erection. We bear down on structural soundness and proved shop methods . . . kick out cost-padding frills . . . eliminate expensive fumbling in production. All standard codes are met—including ASME; API-ASME; API. It's easy to find out how much Posey Iron may be able to save you. Include us among the bidders on your next steel plate fabrication job.

POSEY IRON WORKS, INC.

Steel Plate Division

LANCASTER, PA.

New York Office: Graybar Building

ESTABLISHED SINCE 1910

DIVISIONS
Brick Machinery
Foundry
Industrial Heating
Iroquois
Shipbuilding
Steel Plate

Passenger Conveyors

—Starts on page 28

greater length of straight run belting.

One engineering headache is the problem of maintaining the same angular velocity at all of the accelerator and decelerator wheels which may be contacting a single car at any one time. The use of slip clutches, while expensive, provides a satisfactory solution by eliminating slippage of the tires against the bottom of the car.

Another major problem is the coordination of the movement of the cars to maintain the proper spacing during the starting and stopping of the system. The solution lies in the use of electrical variable frequency or mechanical interlocks.

In conventional mass transit vehicles, passenger discomfort is caused by either vertical or lateral motion or a combination of the two. In addition, passengers are subjected to uncomfortable fluctuations in acceleration and braking. The cars on the Carveyor system can develop neither vertical or lateral motion. They are brought up to speed at a constant rate of acceleration without any disturbing fluctuations. The braking rate is likewise constant and causes no discomfort.

Broader Uses

While originally conceived for continuous straight line use between two busy stations, the Carveyor system has broader application in mass transportation due primarily to the accelerating-decelerating features and to the ability of the system to negotiate curves and bends. By utilizing both an unloading belt and a loading belt in succession, way stations can be incorporated into the system which make it practical for general transit use in heavy traveled areas or to serve as feeder lines to present main line subways. Also, a speed of 15 miles per hour by no means represents the maximum possible.

Installed costs of the Carveyor system are estimated to be less than 60 percent of the cost of conventional subway equipment in existing tunnels.

Operation and maintenance costs of the conveyor are estimated at 40 percent of similar charges for the conventional subway. New construction for a Carveyor subway would be less costly because of less excavation and smaller tunnels required.

The desired system capacity would determine the size of car and the inside of the tunnel dimensions.

A car 4 ft by 7 ft long would have a capacity of 4 seats plus room for 2 standees. At a loading platform speed of 1½ miles per hour, this would allow a capacity of 6,840 passengers per hour. With a 7 ft by 7 ft car this capacity would be increased to about 18,000 passengers per hour. Car capacities can vary from one to 20 passengers per unit.

There should be a minimum clearance of 18 in. between the car and the tunnel wall to permit space for a safety access walk. Car maintenance can be performed between the two parallel runs of "tracks". The minimum distance between the sides of the two parallel car runs should be 2 ft. Therefore the total inside tunnel width for a Carveyor system (two runs side by side) is 13 ft, with a 4 ft car. Using a 7 ft car, the two directional system would require a minimum width of 19 ft.

Car heights are about 7 ft 3 in. and would require an additional 18 in. between the base of the car and the tunnel floor with possibly a one foot clearance above the car. Minimum tunnel dimensions for a Carveyor system using a 4 ft car would be about 13 ft wide by 10 ft high which, in area, corresponds to the size normally required by a single subway car and car track.

Stations between terminal points would consist of unloading and loading platform belts adjacent to each other. A station length of only 180 ft would be required to adequately serve the system. Again, this represents a substantial cost saving from the conventional concept of an underground system.

If necessary, steeper grades are negotiable by the Carveyor than could be normally handled by subway trains. Although it is desirable (and less expensive) to keep the system running in as long and as straight an axis as possible, curves of almost any radii can be incorporated.

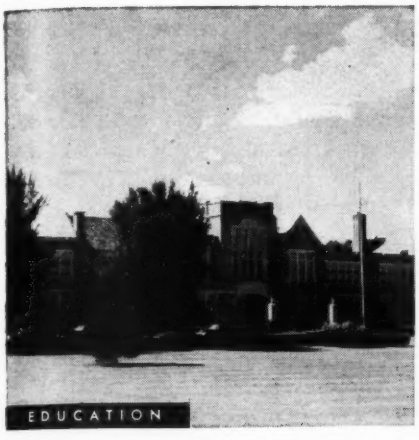
The Carveyor is equally adaptable to operation as an elevated system. Overhead structures would require relatively light supports, since the load is distributed fairly evenly—rather than in peaks—and there is no heavy moving equipment.

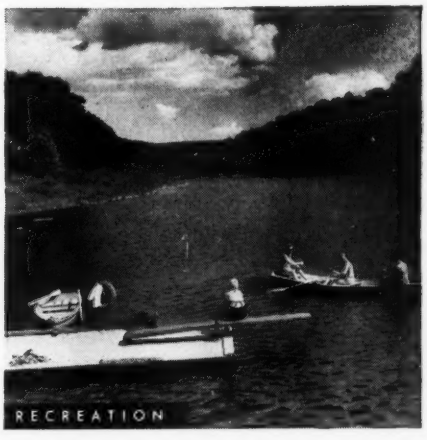
In business and shopping areas, there is a growing trend to install marquees to offer weather protection for the pedestrians and "dress up" the buildings. A similar type structure could be designed to support an enclosure for the Carveyor. The system would have none of the drawbacks of the old "El" structure.

New York City transit engineers are carefully studying the Carveyor proposal and interest has been shown by other cities, not only in the U.S., but throughout the world. Transportation men recognize the many outstanding advantages in the system.

All signs point to major long-term face-liftings in the design and planning of our cities, shopping areas, airports, parking facilities, and other recreational, commercial, and industrial facilities. Passenger conveyors have played a part in bringing about these changes. The future transition will probably see both the Speedwalk and the Carveyor as integral parts of the development. ▲▲

YOUR NEW PLANT WILL GROW IN THE ERIE AREA





Industry "discovers" the middle-sized town

● Yet only recently has industry come to appreciate fully the many advantages of locating their new plants in the middle-sized town.

These ideal communities offer better living conditions—a fuller social life—richer recreational facilities. All these appeal to executive personnel, office employees and plant workers alike.

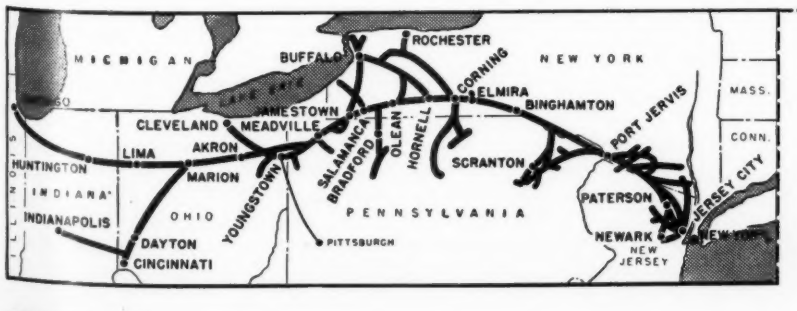
Another advantage: these middle-sized communities fit in perfectly with the Government's Dispersal Plan for industry.

The Erie Area is rich in these middle-sized towns and serves the nation's largest single market. Here one-third of America's people live, work and buy. Raw materials, production and markets are close together.

Industry is served by the dependable Erie Railroad which connects direct with New York Harbor for export business, and offers unsurpassed service between New York and Chicago and nationwide by connecting railroads.

Erie Railroad

Serving the Heart of Industrial America



ERIE

MAIL COUPON TODAY!

D. M. Lynn, *Assistant Vice President*
Industrial Development • Rm.524-A, Erie Railroad
Midland Building, Cleveland 15, Ohio

Dear Sir: We are interested. Please send us your Specification Card on which we can list our needs.

Name .....

Title ..... *Company* .....

Address .....

City ..... *Zone* ..... *State* .....

TRY THIS Hapman TUBULAR CONVEYOR QUIZ:

Let's assume you're a Conveyor-Project Engineer employed by Hapman —

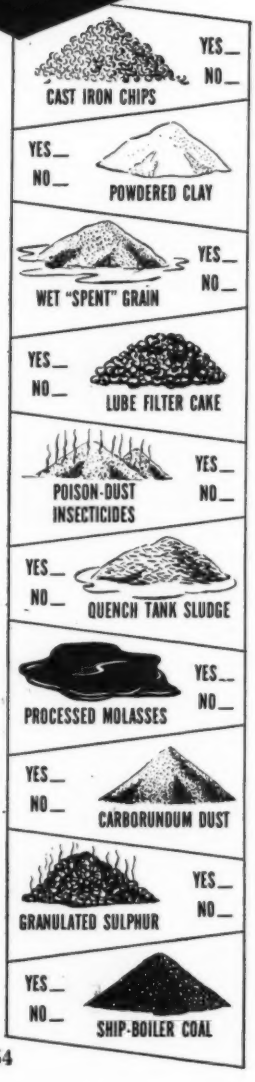
QUESTION 1—Which materials in panel would you advise can be efficiently handled by Hapman Tubular Sealed-pin Chain Conveyors?

QUESTION 2—To elevate a granulated chemical 29 ft. above floor, at 2,000 lbs. per hour, what motor would you specify?

1 H.P.____ 2 H.P.____
3 H.P.____ 5 H.P.____

QUESTION 3—A prospect asks, "What is the *outstanding* advantage of a Hapman Tubular Conveyor?" What's your reply?

ANSWERS: 1—All now successfully handled except sticky molasses. 2—One horsepower. 3—Hard to answer. In one case, ability to convey *wet* material is vital; in another the Hapman's air-tight seal keeps moisture or dust *out*—or fumes *in*. Ability to curve around obstacles may be essential. Your best answer: "They cut costs!"



NOW SEND YOUR QUESTIONS!

Write for details and Bulletin CE-354

Hapman CONVEYORS, INC.
DIVISION HAPMAN-DUTTON COMPANY
KALAMAZOO MICHIGAN

Convention Plans Completed

—*Starts on page 71*

Engineers at the March 25-27 convention of the Ohio Society of Professional Engineers at Akron.

Program committee chairman R. B. McCurdy, Louden Machinery Co., announces the following speakers: Warren Guthrie; C. E. Slusser; T. Carr Forrest, president of NSPE; and Roy Brooks.

The functional group speakers will include: T. J. Kaur, Samuel O. Linzell, and E. W. Carlton.

More than 40 manufacturers will display the newest developments in their fields. Exhibit chairman is C. M. Wilkinson, C. M. Wilkinson Co.

General chairman for the convention is J. E. Kallgren; entertainment chairman G. V. Kullgren, Hale & Kullgren, Consultants. ▲▲

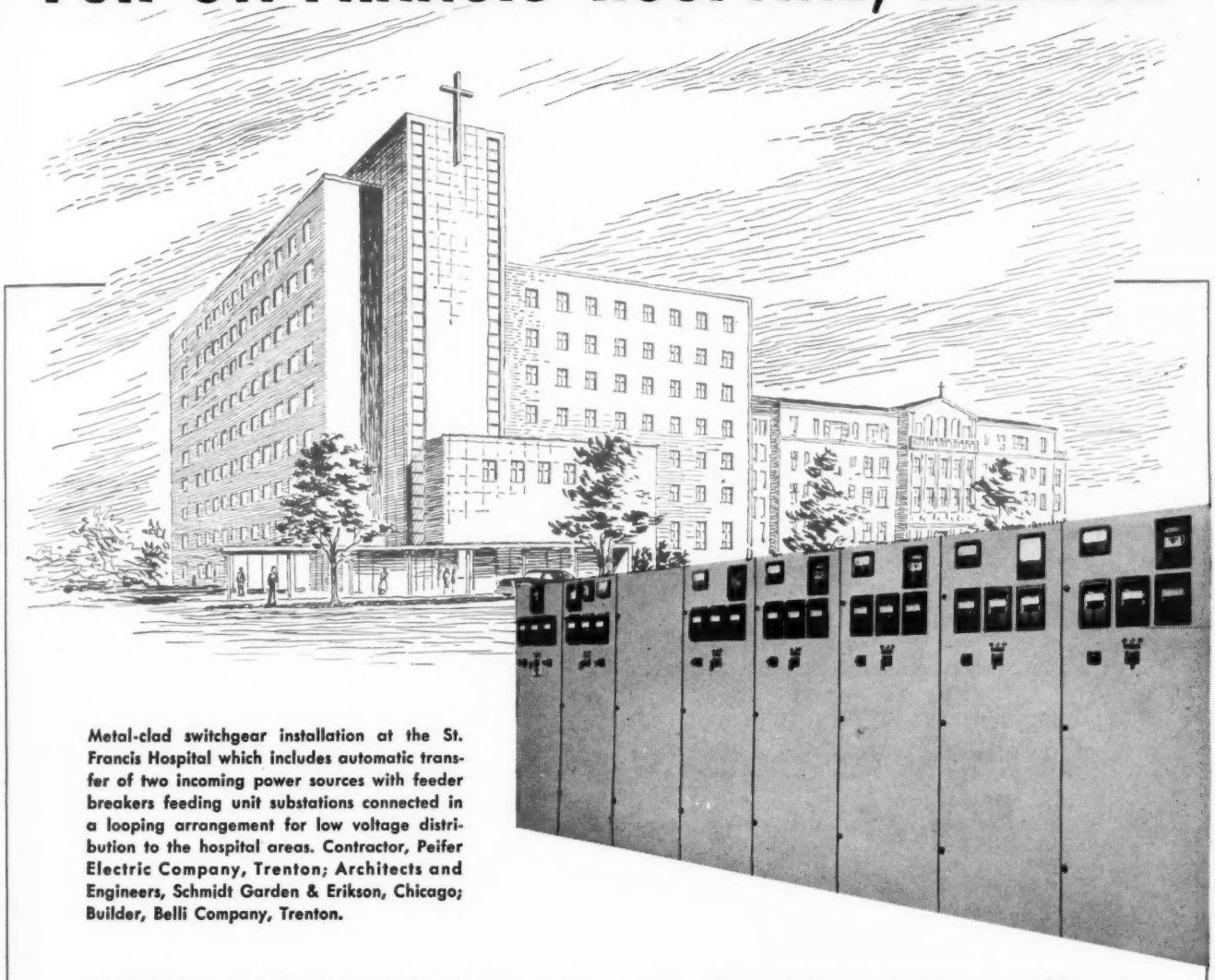
New Company Offers Technical Information Service

The urgent need to provide complete scientific and technical information for the ever-increasing number of engineers who develop and use complex machines and processes is emphasized by the formation of Miles-Samuelson, Inc., 1239 Broadway,

THE LAST WORD IN STEAM POWER — 1907

Size dignified horsepower half a century ago when Cooper-Bessemer steam engines like this one were installed in manufacturing plants. Posed on the unit are 300 employees of the Rarig Engineering Mfg. Co. as they were photographed 46 years ago on the platforms and ladders of a C & G Cooper two-cylinder vertical engine. The modern grandchild, a Type LSV Cooper-Bessemer Diesel engine occupies but a tenth of the space, and is maintained by fewer personnel at less cost. ▲▲

IT'S FEDERAL-PACIFIC SWITCHGEAR FOR ST. FRANCIS HOSPITAL, TRENTON



Metal-clad switchgear installation at the St. Francis Hospital which includes automatic transfer of two incoming power sources with feeder breakers feeding unit substations connected in a looping arrangement for low voltage distribution to the hospital areas. Contractor, Peifer Electric Company, Trenton; Architects and Engineers, Schmidt Garden & Erikson, Chicago; Builder, Belli Company, Trenton.

IN THE NEW WING of the St. Francis Hospital, Trenton, N. J., the entire electrical system is controlled by Federal-Pacific equipment. The installation includes a 5 kv metal-clad switchgear installation employing magnetic air break circuit breakers, unit substations, and necessary lighting and distribution panelboards.

Federal-Pacific electrical equipment for light and power is today's leading specification both for new construction and modernization programs. Most of this equipment is quickly and economically assembled from standard units to meet specific requirements. You can always look to it for lowest installation costs . . . and for engineering that assures top efficiency, easy maintenance, and ready adaptability for future changes or expansion.

When you have an electric distribution problem, Federal-Pacific will be glad to study it. Write Federal Electric Products Company, 50 Paris St., Newark 5, New Jersey.

FEDERAL & PACIFIC

ELECTRIC PRODUCTS COMPANY — ELECTRIC MANUFACTURING CORP.

Federal products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct — **Pacific Electric products:** High voltage circuit breakers and power switches ★ Sales offices in principal cities.

Information Service Offered

—*Starts on page 84*

N. Y. The company maintains a permanent full-time staff of mechanical, electronic, and aeronautical engineers, as well as a staff of scientists, educators, writers, and technical illustrators to write, illustrate, and publish for its clients accurate, understandable, up-to-date information on equipment and processes in specialized fields.

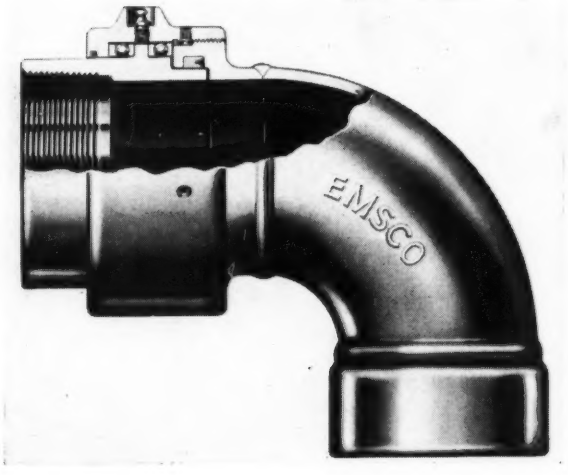
The ideas for a comprehensive technical information service were originally developed by Samuel A. Miles, vp, in papers which he presented at the symposium "Operation Knowledge" at the meeting of the American Association for the Advancement of Science in 1951 and at the panel discussion on engineering literature at Dartmouth in 1952. ▲▲

Beryllium Copper Alloys Are Resistant to Cold

Mechanical properties of beryllium copper withstand temperatures as low as –300 F, according to results of a two-year study conducted at the University of Pennsylvania.

Sponsored by the Beryllium Corp., the tests were confined to commercial types of wrought and cast beryllium copper alloys.

Properties measured included tensile and impact strengths, elongation, and elastic modulus. Results indicate that beryllium copper performs with unhampered and even heightened efficiency under subzero conditions that generally cause failure in other standard design materials. ▲▲



Swivel Fitting is Designed For Low Pressure Use

Specially designed for applications and pressures to which schedule 40 pipe would be subjected, Type LPR Emsco ball bearing swivel fitting is for a maxi-

Complete data on Sites or Buildings to help you service clients

—get it *quickly and without* cost from Industrial Location Service of New York State.

To select a new plant location for one of your clients, you often need information on specific sites that includes details on acreage, dimensions, soil characteristics, relation to transportation facilities, utilities, ownership, and cost. Or, you may want complete descriptions of available industrial buildings.

This factual data on sites or buildings in areas you have selected, or which we might suggest on the basis of your client's requirements, can be yours—simply by writing to the New York State Industrial Location Service.

If you desire, maps, plans, or photographs of sites and buildings will also be prepared and sent without obligation. All the information you receive is completely confidential.

AUTHORITATIVE DATA IS ALSO AVAILABLE ON:

RAW MATERIALS: Cost and availability of all materials and supplies needed.
TRANSPORTATION: Availability of facilities, cost of assembling materials and distributing finished product between any given points.
MARKETS: Industrial and consumer market data.
LABOR: Availability, skills, and rates.
POWER AND FUEL: Character and cost at any point.
AVAILABLE BUILDINGS: Types, condition, facilities and terms. Confidential.
SITES: Availability, size, character, installed services; photos and maps. Confidential.
COMMUNITY SERVICES: A complete report on the facilities and attitudes of any community.
LAWS AND REGULATIONS: Full data on laws or regulations applying to any particular form of enterprise.

Industrial Location Service of New York State

GET FREE BROCHURE: "Industrial Location Services." Also detailed physical map of New York State. Write New York State Department of Commerce, Room 834, 112 State St., Albany 7, New York.

"WE DON'T SELL SITES—WE MATCH NEEDS"

SPRINGFIELD BOILERS

ANOTHER REPEAT ORDER STORY

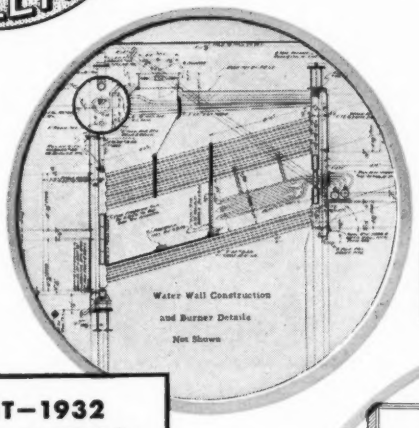
CITY OF COLORADO SPRINGS

Builds New Power Plant

SPRINGFIELD Selected for 3rd Time!

This latest installation more than doubles the City's capacity at—

1. Higher Pressure
2. Higher Temperature

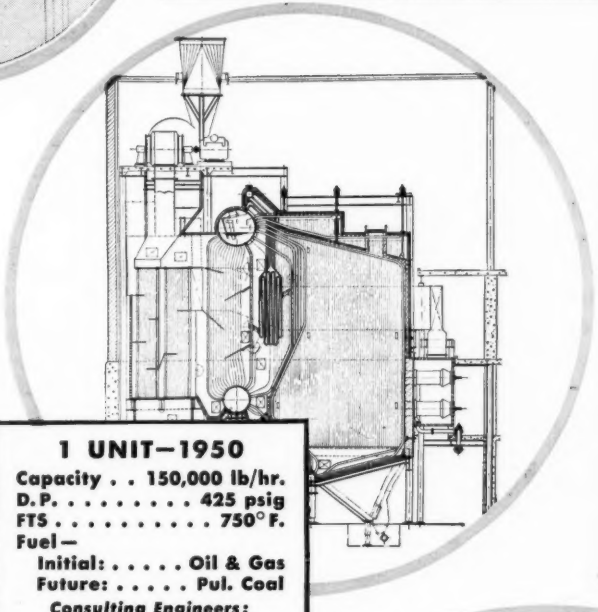


1 UNIT—1932
Capacity . . . 55,000 lb/hr.
D.P. . . . . 430 psig
FTS . . . . . 750° F.
Fuel . . . . . Gas & Oil

SPRINGFIELD PROVIDES

- Sound Engineering Design
- Superior Craftsmanship
- Reasonable First Cost
- Ease of Operation
- Low Operating Cost
- Guaranteed Performance
- Minimum Down Time
- High Efficiency

SEE SPRINGFIELD in SWEETS



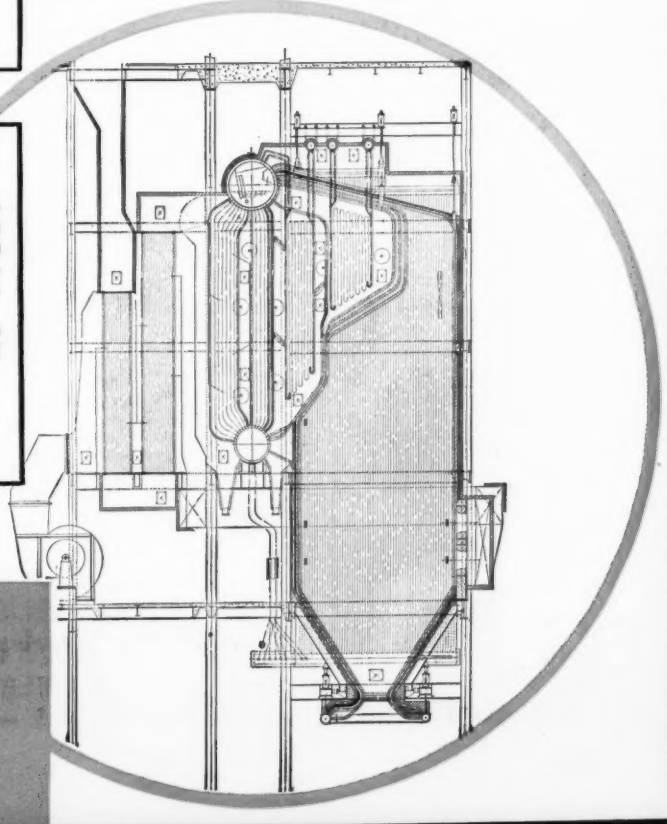
1 UNIT—1950
Capacity . . 150,000 lb/hr.
D.P. . . . . 425 psig
FTS . . . . . 750° F.
Fuel—
Initial: . . . . . Oil & Gas
Future: . . . . . Pul. Coal
Consulting Engineers:
LUTZ & MAY
Kansas City, Mo.

The City of Colorado Springs' third order for Springfield Generators gives the City a total installed capacity of over a half million pounds of steam per hour. The two latest units, housed in a new plant, are designed for 975 psig with an attemperator controlled final steam temperature of 900 deg. F., following the trend of higher pressures and higher temperature for greater overall economy.

J. H. Wiley, Supt. of Electric Div., Dept. of Utilities, City of Colorado Springs, and the Consulting Engineers are just a few of the many who have found it advantageous to "repeat with Springfield" when expanding. One large midwestern manufacturer has purchased 38 Springfield Steam Generators.

Many Consulting Engineers have favored Springfield with repeat recommendations. They always find Springfield helpful and cooperative not only in the preliminary design stage and right on through to completion, including training of the Purchaser's operating personnel, but also throughout the life of the unit.

Check with Your Consulting Engineer on Modernization and New Plant Projects



2 UNITS—1952
Capacity—
each . . . 160,000 lb/hr.
D.P. . . . . 975 psig
O.P. . . . . 875 psig
FST (Con.) . . . . . 900° F.
FWT . . . . . 360° F.
Fuel—
Initial: . . . . . Oil & Gas
Future: . . . . . Pul. Coal
All predicted performances met without alteration
Consulting Engineers:
LUTZ & MAY
Kansas City, Mo.

WRITE FOR SPRINGFIELD'S 1954 CATALOG

Worldwide Sales and Service

SPRINGFIELD BOILER CO.

FOUNDED IN 1890

DIVISION OF *John W. Hobbs Corporation*

1958 E. Capitol Avenue • Springfield, Illinois

Fitting for Low Pressure Use

—*Starts on page 86*

mum pressure of 1000 psi at a maximum temperature of 225 F.

The outstanding feature of this fitting is said to be its unusual free turning qualities. The thrust load is taken directly through the center of the balls. The hardened and ground races on which a double row of ball bearings rotate are perpendicular to the lines of force.

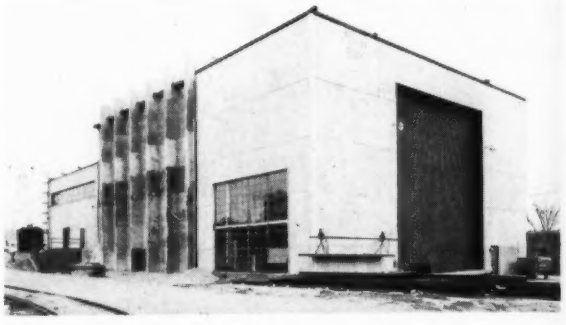
Packing materials, including Teflon for corrosive and other services, are independent of the ball rows and are unaffected by ball race wear. The packing can be replaced and adjustments made for normal wear while the fitting is in service.

For more information, write to Emsco Manufacturing Co., Dept. 73, P. O. Box 2098, Terminal Annex, Los Angeles 54, Calif. ▲▲

Computer Aids in Scheduling Power Generation

The transmission penalty factor computer (TPF), being built by the General Engineering Laboratory of General Electric, is the first device of its kind designed to introduce transmission line losses as a factor in the problem of scheduling generation to meet the ever-changing demand for power in a large power system.

To be installed in the production co-ordination office of the American Gas & Electric Service Corp., TPF will be set to express the power system mathematically, including number of stations, inter-connections with other systems, amount of electricity being generated, and distribution of users. ▲▲



TRANSFORMERS TO BE NOISE-TESTED

The sound testing laboratory building under construction at General Electric's transformer plant in Pittsfield, Mass. will house what is probably the quietest room in the world of comparable size. Sound proofed by 4½ ft thick concrete, masonry, and copper shielding, the sound chamber is 56 ft wide, 66 ft long, and 49 ft high. Specially designed Fiberglas wedges will eliminate echo. Test results are expected to point the way to reducing noise-making vibrations. ▲▲

• "Unit Pilot Valve" easily removable—and renewable.

• Stainless Steel parts for lower maintenance, longer wear.

• Sizes from ½" to 6" — Screwed or flanged.

• Initial pressures to 300 lbs. steam, 600 lbs. air. Reduced pressures to a low of 1 lb.

• Varied pressure control obtained without change of springs.

• Available in various combinations for pressure control, temperature control, single unit pressure and temperature regulation as well as constant pressure pump governors.

• Completely interchangeable parts for comparable sizes.

Control reduced pressures more accurately!

KECKLEY

Pressure Regulators

Where you have to maintain ACCURATE reduced pressures for air or steam, your best bet is a precision pressure regulating valve from Keckley. These valves feature a highly sensitive diaphragm and spring design that gives dependable automatic compensation for fluctuating initial pressures, and constant reduced pressures that you can depend on. Standard stainless steel unit pilot valve, main valve and seat can be removed easily for inspection. Here is a valve that is rugged, dependable and unbelievably economical to maintain.

Standardize on Keckley for the best in pressure regulators.

Send for your copy of this catalog—54-1

O. C. KECKLEY COMPANY

400 W. Madison St. • Chicago 6, Ill.

NOW!! the NEW BOLTLESS TAPPING SLEEVES

for CAST IRON PIPE
for CEMENT-ASBESTOS PIPE

Top economy in installation and maintenance because NO CAULKING NECESSARY — allows even unskilled workmen to do faster, better installations. LESS EXCAVATION and MORE WORKING AREA through new, simplified mounting process. Assured LIFE OF PIPE SERVICE.

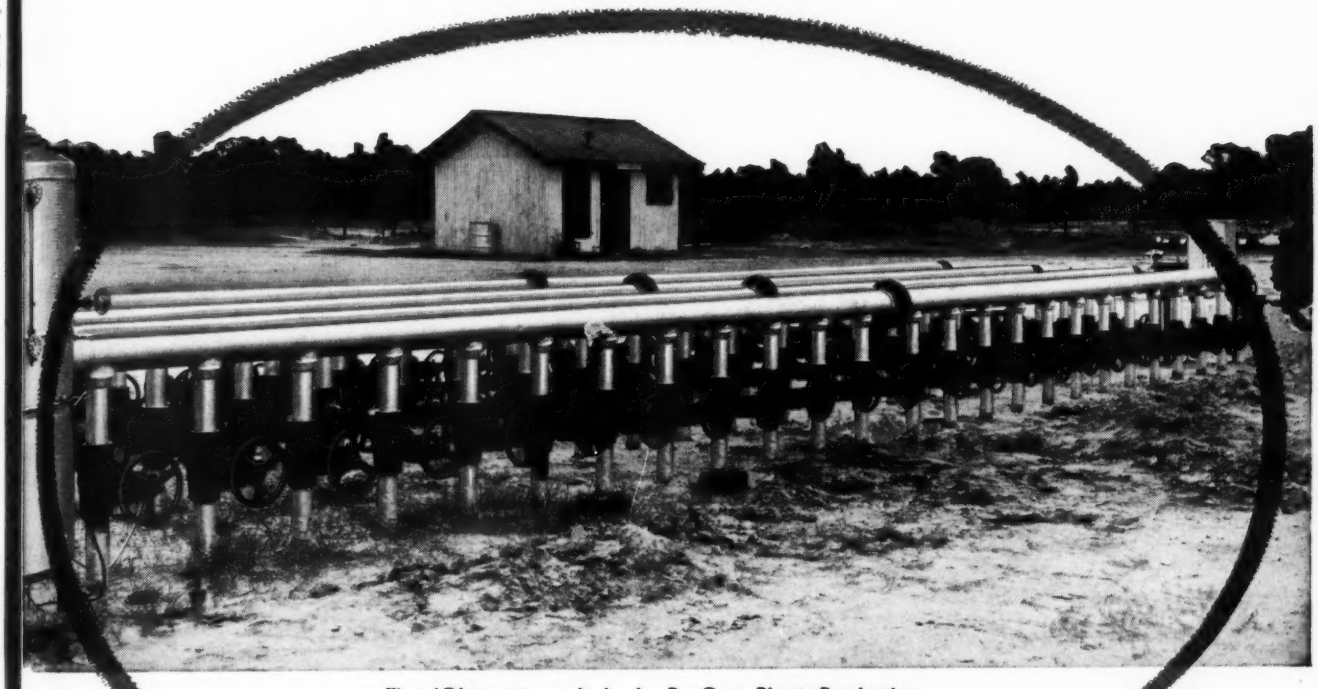
Qualified Dealers and Distributors Wanted in Key Areas

Write for full information TODAY!

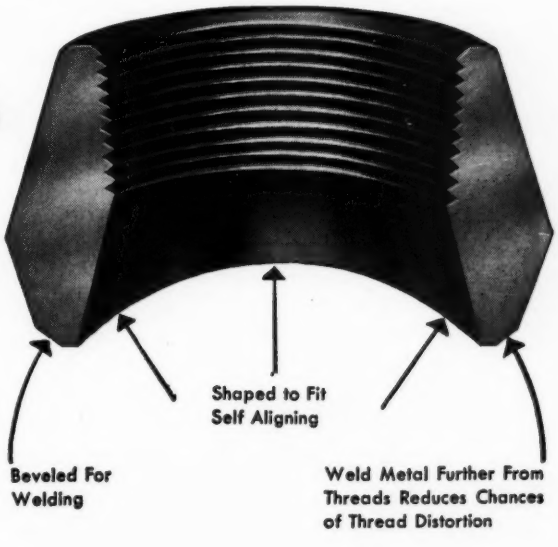
COREY MFG. CO.

3279 Verdugo Rd., Dept. 27
Los Angeles 65, Calif.

BOOST YOUR PRODUCTION with THREDOLETS and SOCKET WELDOLETS!



ThredOlets at work in L. P. Gas Plant Production Separators. 4" x 2" ThredOlets utilized for branch connections on manifolds subjected to contraction, expansion and vibration. The ThredOlet's short height and wide footing creates rugged branch construction.



Insure production economy in pipe fabrication through the *exclusive* features *engineered* and *manufactured into* ThredOlets and Socket WeldOlets. Production is boosted because you weld *more pieces* per hour!

Instant application and immediate availability will save you time, labor and money in constructing all 90° Threaded and Socket-weld branch connections.

SPECIFY AND USE...
BONNEY THREDOLETS & SOCKET WELDOLETS

FOR COMPLETE ENGINEERING DATA WRITE FOR YOUR BONNEY W-3 WELDOLET CATALOG
DISTRIBUTORS IN PRINCIPAL CITIES

ThredOlets

Socket WeldOlets

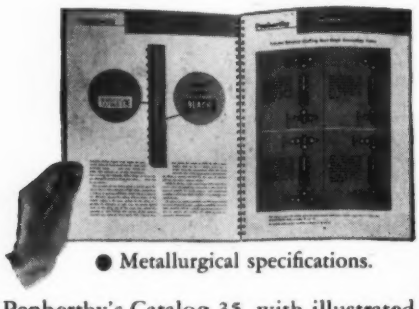
WELDING FITTINGS DIVISION
BONNEY FORGE & TOOL WORKS
ENG. DEPT. 370 GREEN STREET
ALLENTOWN, PENNSYLVANIA

Facts at your FINGERTIPS

● The advantages of Reflex Liquid Level Gages. The right type and size gage with suitable valves for pressure, temperature, visibility range and valve centers. Multiple section gages. Drop Forged bodies. Pyrex glass. Basic and special designs.

● When to use Transparent Liquid Level Gage Sets. High pressure steam service. Adapters, valves, connections. Types available.

● Tubular Liquid Level Gages and a selection of Gage valves. Specifications. "Floating Shank." Connections and special features.



● Metallurgical specifications.

Penberthy's Catalog 35, with illustrated facts and specifications, is your best guide to selecting the right liquid level gage sets at the most economical cost. In the complete Penberthy line, there are standard products for almost every application. Where your needs are special or unique, use our experience of almost 70 years to solve them. Many thousands of satisfied users. Write for your copy of Catalog 35.

Established 1886

PENBERTHY INJECTOR COMPANY

Division of the Buffalo-Eclipse Corporation

1242 Holden Ave., Detroit 2, Michigan

There's Certain satisfaction in

PRODUCTS BY

PENBERTHY

- **EJECTORS**
- **EDUCTORS**
- **EXHAUSTERS**
- **SYPHONS**
- **ELECTRIC SUMP PUMPS**
- **CYCLING JET PUMPS**
- **INJECTORS**

BOOKLETS

Personal copies of booklets can be obtained by writing directly to the manufacturers

SAFETY TREAD and threshold catalog, 12 pages, is sectioned to show a complete variety of treads and the metals in which they are available. Safe Groove and Abrasive Cast Treads, Extruded Cast and Abrasive Thresholds, and miscellaneous accessories such as plates, curb bars, window and elevator sills, are shown in cross sectional drawings. *Wooster Products, Inc., Dept. CE, Wooster, Ohio.*

WHY, HOW, AND WHERE modern industry uses paving brick is explained in 12-page booklet "Brick Floors." Typical installations are shown for the various types of brick. Tested procedures for laying brick floors are given. *Metropolitan Brick, Inc., Dept. CE, Canton, 2, Ohio.*

UP-TO-DATE information on the full line of BARCOL industrial, commercial, and residential overhead-type doors is summarized in 16-page "BARCOL OVERdoor GUIDE." It gives complete specifications and instructions for preparation of building openings and installation of all models. Typical examples of special installations, where building conditions do not permit the use of standard equipment, are also illustrated along with electric operators and radio controls. *Barber-Colman Co., Dept CE, Rockford, Ill.*

"PC GLASS BLOCKS for Industrial, Commercial, and Public Buildings," 23-page booklet, is designed to be a reference manual for engineers and architects. Information on physical performance, technical data on light transmission, insulation values, installation detail drawings, accessory materials, and complete specifications are fully covered. An interesting feature of the catalog is an easy-to-read pictorial description that makes an easy job of selecting the proper functional pattern for maximum daylighting results. *Pittsburgh Corning Corp., One Gateway Center, Pittsburgh 22, Pa.*

AUTOMATIC and manually-operated self-cleaning strainers, Kinney

EXTRA YEARS

OF MORE DEPENDABLE POWER

and at less cost per pound of steam

TODD BURNERS

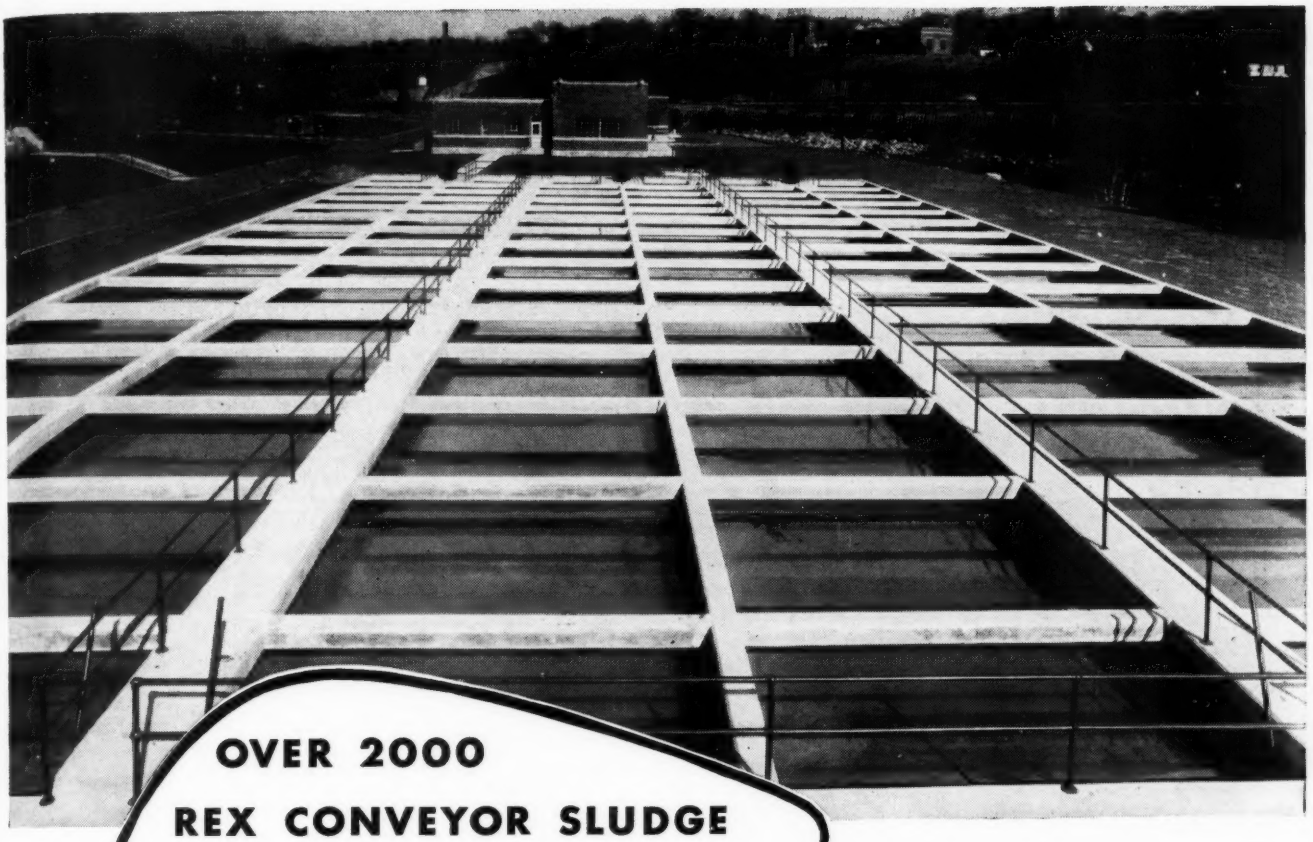
GAS OR OIL

COMBUSTION EQUIPMENT DIVISION

TODD SHIPYARDS CORPORATION

81-16 45th Avenue **Elmhurst, Queens, N. Y.**

TODD NEW YORK, U.S.A.



OVER 2000 REX CONVEYOR SLUDGE COLLECTORS IN OVER 700 CITIES AND INDUSTRIES!

WHAT BETTER PROOF of Rex superiority?

YES over 700 cities and industries rely on Rex® Conveyor Sludge Collectors for efficient, dependable and economical operation. These precision engineered sludge collectors are applicable for all types of sludge handling or surface skimming conditions in either sewage; water or industrial waste treatment application . . . no application is too large or too small . . . and each receives the full benefit of Rex Engineering.

Here are some of the outstanding time-proven features of Rex Sludge Collectors that make them leaders in their field:

★ ***Balanced Equipment Design***—design proportionate throughout.

★ ***Rex Z-Metal Chain*** and attachments—corrosion and wear resistant.

★ ***Self-Aligning Bearings***—easy to install. Compensate for tank irregularities . . . prevent accumulation of settled solids.

★ ***Offset Split Drive Sprockets***—eliminate bulky cantilevered brackets. Easy to replace.

★ ***Centralized, Hardened Wearing Shoes***—eliminate splitting strains on wooden scraper flights. Means longer life, lower maintenance.

★ ***Double Life Sprockets***—chain engages only every other sprocket tooth.

★ ***Drive Unit***—compact, totally enclosed. Shear pin protection. Jaw clutches provided where independent operation is required.

★ ***Sub-Assemblies***—shop assembly of drive units and shaft assemblies assure proper alignment and fit.

MAKE SURE YOU WILL BE THE NEXT ONE to profit from Rex design and Rex quality. Get all the facts on Rex Conveyor Sludge Collectors. Call your nearest Rex Sanitation Engineer or write for Bulletin 47-9. Chain Belt Company, 4797 W. Greenfield Ave., Milwaukee 1, Wisconsin.

REX®

Chain Belt COMPANY OF MILWAUKEE

Atlanta • Baltimore • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland • Dallas Denver • Detroit • El Paso • Houston • Indianapolis • Jacksonville • Kansas City • Los Angeles Louisville • Midland, Texas • Milwaukee • Minneapolis • New York • Philadelphia • Pittsburgh Portland, Ore. • W. Springfield, Mass. • St. Louis • Salt Lake City • San Francisco • Seattle • Tulsa • Worcester

Distributors in Principal Cities in the United States and abroad.

Export offices: 4800 W. Mitchell Street, Milwaukee, Wisconsin; and 19 Rector St., New York City

The WORLD'S LARGEST BOILER..

Housed in this 14-story building at Consolidated Edison's Hudson Ave. Plant in Brooklyn, N. Y.

..DEPENDS ON Sier-Bath SCREW PUMPS

Internal Gear and Bearing Vertical Type. 75 HP, 1180 RPM. Handles 300 GPM at 210 PSI, 10,000 SSU.

LEFT—being readied for shipment: one of the six Sier-Bath Screw Pumps selected by Consolidated Edison for vital burner service in the Hudson Avenue Plant installation. As the pumps had to be installed completely *submerged* (making repairs and servicing difficult and costly), prime factors in their choice were *dependability* and *low maintenance needs*. The following features give these qualities to Sier-Bath Screw Pumps:

- **No Metallic Contact Between Rotors**—sustains high volumetric efficiency.
- **High Volumetric Efficiency** — reduces wear caused by erosion.
- **Low Pressure on Stuffing Boxes**—reduces leakage, adds to packing life.
- **Long, Trouble-Free Life**—husky shafts, rotors—high load capacity bearings, deep stuffing boxes.
- **Self Priming • Pulseless Discharge • Direct-connected up to 1800 RPM.**

Models for 1-700 GPM, discharge 1000 PSI for viscous liquids, 500 PSI for water. Available in horizontal or vertical construction, corrosion resistant alloys. Special bodies, stuffing boxes and bearings for high temperature applications.

WRITE FOR BULLETIN

Sier-Bath GEAR and PUMP CO., Inc.

9257 HUDSON BLVD., NORTH BERGEN, N. J.

Founded 1905 Member A.G.M.A.

Also Manufacturers of Gear Pumps, Gear Couplings, and Precision Gears

BOOKLETS —*Starts on page 90*

and Brassert types, are described by means of cross-sections and full-page diagrams. Engineering data in this 12-page bulletin BK500 includes tables of operating capacities and dimensions. *S. P. Kinney Engineers, Inc., Dept. CE, 201 Second Ave., P.O. Box 445, Carnegie, Pa.*

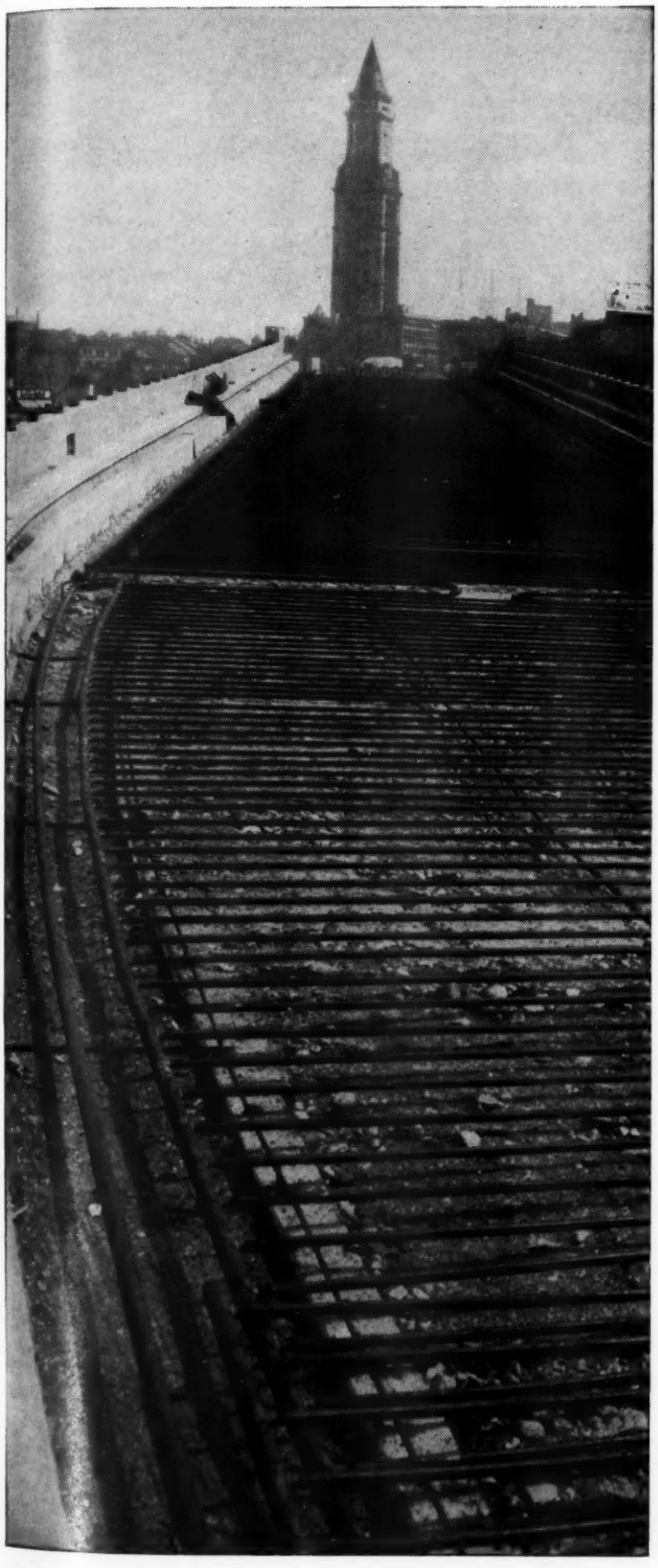
CORRUGATED ALUMINUM roofing and siding, which is finding a rapidly increasing market as a building material for industrial shops and buildings, is described in 16-page booklet, "Alcoa Aluminum Corrugated Industrial Roofing and Siding." Application methods outlined include fasteners such as self-tapping screws, Nelson Rivweld studs and Widman fasteners. Accessories for application of Alcoa roofing and siding such as flashing, ridge roll, and closure strip are shown, as are loading, weight, and coverage tables. Drawings present roofing and siding details on basic types of industrial structures. *Aluminum Company of America, Dept. CE, 804 Alcoa Bldg., Pittsburgh 19, Pa.*

STAYNEW AUTOMATIC filters designed for large air volume and high efficiency are described in 12-page bulletin 500. Specifications, engineering, and performance data covering automatic filters in a wide range of sizes for handling any desired air capacity are given. *Dollinger Corp., Dept. CE, 11 Centre Park, Rochester 3, N. Y.*

"INDUSTRIAL PRODUCTS Catalog," 40-page revised catalog, offers essential data on insulations, refractory products, asbestos cement pipe, packings, gaskets, electrical products, frictional materials, roofing, siding, flooring, partitions, and ceilings. Photographs, diagrams, and text have been revised and brought up-to-date. *Johns-Manville Corp., Dept. CE, 22 East 40th St., N. Y. 16.*

"G-E INSTRUMENT Transformer Buyer's Guide," 1945 edition, GEA-46266, 96 pages, contains ratings, ASA accuracy classifications, and prices of all G-E indoor and outdoor potential and current transformers. Listings of ratio and phase-angle tests, together with tables covering the mechanical and thermal limits of current transformers, are included. *General Electric Co., Dept. CE, Schenectady 5, N. Y.*

"FOAMGLAS — the Long-Life, Stay-Dry Insulation, for Industrial, Commercial, and Public Buildings," 24 pages, lists condensed specifications for the application of FOAMGLAS in walls, ceilings, floors, roofs,



World's Largest Snow Melting System Uses Wrought Iron Pipe

More than 200 tons of corrosion-resistant wrought iron pipe forms snow melting grids on sixteen ramps serving Boston's 200-million dollar Aerial Highway

When completed, the access ramps leading to Boston's Aerial Highway will be the modern answer to the winter motorists' dream.

Heated by coils of wrought iron pipe, these pavement ramps will provide a dry road surface in blustery cold weather months to protect the motorists from dangerous skidding hazards and the driving threat of winter traffic jams.

More than 200 tons of wrought iron pipe, selected because of its ability to resist corrosion and vibration, and its ease of installation, are arranged in series and buried in the concrete. To operate, steam supplied by Boston Edison Company, is fed to heat exchangers. Water mixed with Ethylene-Glycol anti-freeze, is circulated through the heat exchangers and wrought iron pipe network. The heated pavement melts snow as it falls, prevents ice from forming.

This modern expressway, designed by Architects-Engineers Fay, Spofford & Thorndike and the Commonwealth of Massachusetts Bridge Department, again reflects Boston's leadership in adapting snow melting systems to winter weather problems. The Merrill Company were Heating Contractors, and the V. Barletta Company were General Contractors. The Jarvis Engineering Company fabricated all pipe coils for the snow melting system.

Wrought iron pipe is establishing durability records in snow melting systems under sidewalks, store entrances, factory platforms, garages, hangers, and other surfaces where snow and ice create safety and production hazards. For complete details, write for our bulletin, WROUGHT IRON PIPE FOR SNOW MELTING SYSTEMS.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Dept.: New York, N.Y.

BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

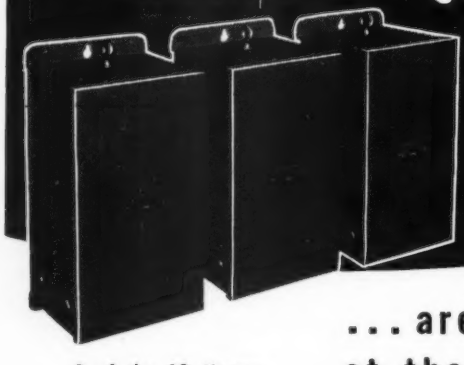
WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

WHERE SAFETY AND DEPENDABILITY COUNTS...

MARCUS dry type TRANSFORMERS



3 of the 19 Marcus transformers installed, with ratings up to 150 KVA.

... are STAR PERFORMERS at the Cincinnati Garden!

Feeding the power where and when needed at Cincinnati's huge and busy "Garden" is another important assignment for MARCUS Dry Type Transformers.

Because all Marcus Dry Type Transformers are now being constructed with Hi-Heat, Hi-Dielectric Magnet Wire, insulation levels of at least 10 times present industry standards are easily attained.

This factor alone, plus an enviable record of trouble-free performance and matchless dependability made Marcus Dry Type Transformers the choice of the Beltzhoover Electric Co., of Cincinnati, Electrical Contractors for the project, and A. M. Kinney, Inc. the consulting Engineer on the job.

Increase your power Performance Standards with Marcus Dry Type Transformers.

Capacities from 1 to 3000 KVA

- DISTRIBUTION
- GENERAL PURPOSE
- UNIT SUBSTATION
- PHASE CHANGING
- ELECTRIC FURNACE
- RECTIFIER
- WELDING
- MOTOR STARTING
- SPECIAL

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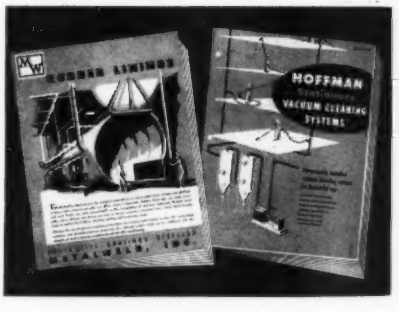
BOOKLETS —Starts on page 90

perimeters, and in low temperature space insulation. Complete information on all accessory materials is also given. Physical properties, characteristics, and performance data of the insulation are fully covered. *Pittsburgh Corning Corp., Dept. CE, One Gateway Center, Pittsburgh 22.*

RUBBER LINING—Advantages and application of rubber lining to steel tanks, drums, pipes, valves, fittings, and pumps are described in an eight-page bulletin. Tables list resistance to inorganic acids, salts and alkalies, organic materials, and many other solutions. Plant facilities for cementing, lining, and vulcanizing all types and sizes of equipment are illustrated, and the B. F. Goodrich Vulcalock Bonding Process, which joins rubber and steel together with a bond strength of over 500 psi, is described. *Protective Coatings Div., Metalweld, Inc., Dept. CE, Scotts Lane & Abbotsford Ave., Philadelphia 29, Pa.*



VACUUM CLEANING EQUIPMENT designed to combat the costly problem of industrial dust is described in 11-page bulletin A-939. Basic working elements of permanently installed vacuum cleaning systems with central dust collection are explained in detail. Function of portable separators, water traps, material intake valves, electric bag shakers, and rotary discharge valves is explained. Five questions cover preliminary data required for the design of any plant vacuum cleaning system. *Air Appliance Div. of U. S. Hoffman Machinery Corp., Dept. CE, 105 Fourth Ave., N. Y., N. Y.*

"SUBSOIL INVESTIGATIONS," 18-page brochure, points out the importance of soil samples, field testing and control, and a properly planned soil investigation procedure. A logical procedure for accumulating necessary data is given. Photographs and sketches supplement the text. *Soil Testing Services, Inc., Dept. CE, 3521 N. Cicero Ave., Chicago 41, Ill.*

CONTROLS FOR WASTE treatment equipment are pictured and described in 9-page foldout. Manually,

NOTES

for the engineer's note book

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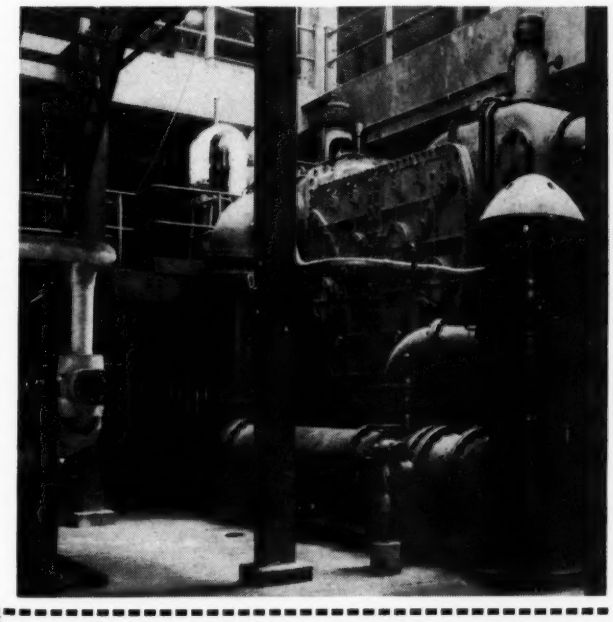

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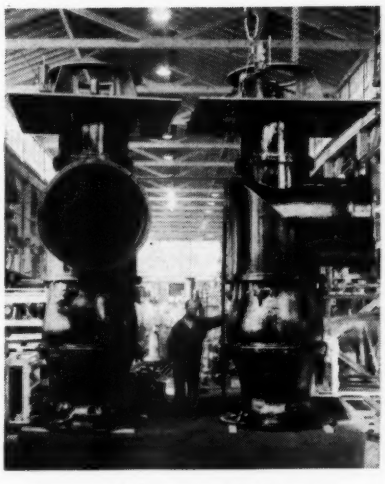

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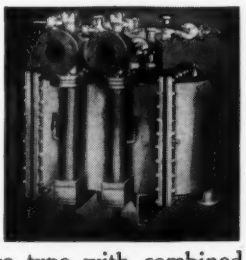

C. H. Wheeler Steel Shell Tubejet Air Ejectors provide worthwhile savings in space and weight. They are available with either single or multiple element, two-stage type with combined surface inter-after condenser. Write for Bulletin.

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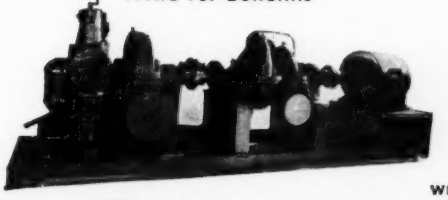

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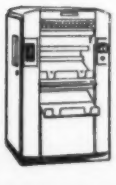

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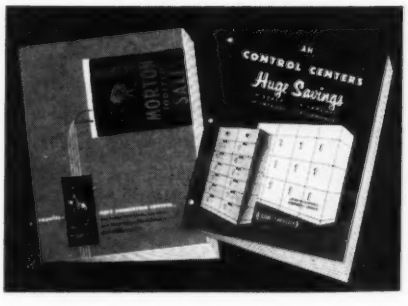
BOOKLETS —*Starts on page 90*

semi-automatically, and fully automatically controlled chlorinators for industrial waste and domestic sewage treatment are included. *Wallace & Tiernan, Inc., Dept. CE, 25 Main St., Belleville 9, N. J.*

AUTOMATIC SUMP PUMPS—Standard series, explosion-proof, totally enclosed, and submersible type pumps are described in four-page folder 5382. Selection information includes tables of capacities, water consumption, and dimensions. Line drawings are shown for both sump pumps and pit drainers. *Penberthy Injector Co., Div. of Buffalo-Eclipse Corp., Dept. CE, 1242 Holden Ave., Detroit 2, Mich.*

SEMI-OUTDOOR BOILER—Eight-page bulletin R-10 gives an account of Morton Salt Company's "exposed" steam generator at Manistee, Mich. Featuring air flow, steam flow compensated Hays combustion control, the boiler is described as handling load swings up to 80,000 lb per hr at 85 percent efficiency. Photographs explain operation of the control system. *The Hays Corp., Dept. CE, Michigan City, Ind.*



HOW MOTOR CONTROL centers provide savings in space and expense, and give improved performance is explained in 12-page bulletin 170. Electrical and constructional details of these groups of combination motor starters and their components are fully described. Rating and ordering data are included. *Arrow-Hart & Hegeman Electric Co., Dept. CE, 103 Hawthorn St., Hartford 6, Conn.*

WATER COLUMNS—Data page 232 describes, illustrates, and gives specifications on this company's water columns. Principle of operation

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and features that assure positive alarm signals if boiler water falls too low or rises too high are shown. *Jerguson Gage & Valve Co., Dept. CE, 80 Fellsway, Somerville 45, Mass.*

PIPE—Typical applications of lightweight lockseam-spiralweld pipe and fittings are contained in four-page engineering bulletin 507. Included are standard specifications on pipe from 4 to 30 in. in dia, together with data on fabricated fittings, flanges, and connections to meet all pipe line requirements. *Naylor Pipe Co., Dept. CE, 1230 East 92nd St., Chicago 19.*

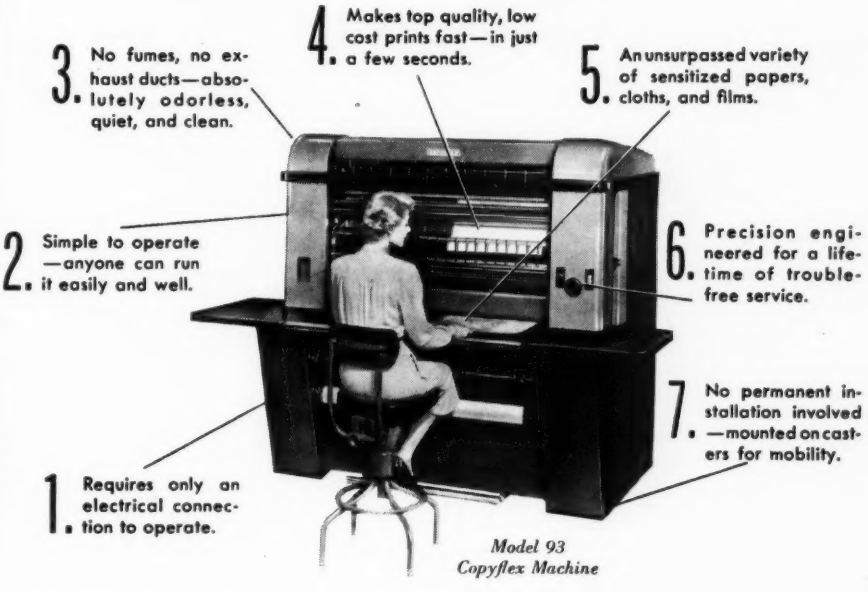
WATER COOLING TOWERS—Based on the experience of more than 25 years in designing, producing, and testing all types of mechanical draft cooling towers, this 30-page brochure presents the case for cross-flow cooling as the method that offers the greatest number of advantages. Cross-sectional drawings illustrate principles of operation of single, double, and twin-flow units. Design features are explained by means of photographs. *The Marley Co., Dept. CE, Fairfax and Morley Rds., Kansas City, Mo.*

"LIGHT ON THE FUTURE," 30-page booklet, reviews the significant principles and components of electronic data processing equipment. With a brief comparison of construction and applications of analogue and digital computers, the booklet explains the organization of digital computers, and functions of the input, storage, arithmetic, control, and output components. The most advanced "memory" devices—magnetic tapes, magnetic drums, and cathode ray tubes—are described in detail along with the stored program concept and its advantages. *IBM Dept. of Information, 590 Madison Ave., Dept. CE, New York 22, N. Y.*

STANDARDIZATION of core form power transformers is discussed in 40-page booklet B5914. Besides covering the construction and operation characteristics, this booklet describes the various standardized processes used during manufacture of a Type SL power transformer. Methods of quality control, shipping, determining and limiting sound levels, and preserving oil are discussed. *Westinghouse Electric Corp., Dept. CE, Box 2099, Pittsburgh 30.*

MERCURY SWITCHES of standard design for use in a-c or d-c switching applications where there is tilt motion and low operating force are described in 12-page catalog 90. Complete information on protected, heavy duty, general use, small and sensitive mercury switches includes dimensions, description, electrical rating, differential angle, lead wires, and the type of application that each

Seven Good Reasons for Specifying Copyflex for Your Next Copying Machine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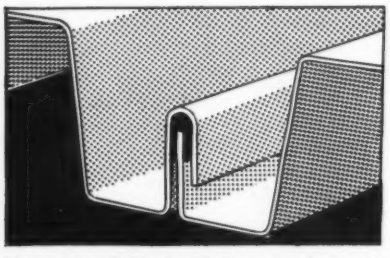
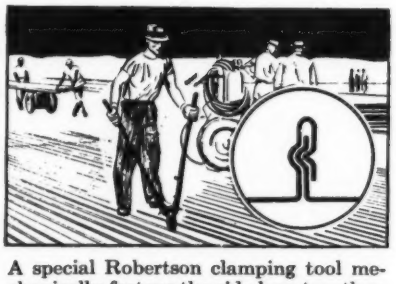
Quickly erected Q-Deck helps lower roof fire hazard

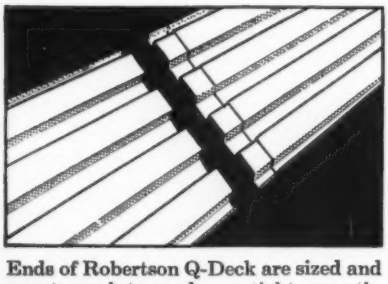
The many unique features of Robertson Q-Deck make it of special interest to the architect and engineer who is concerned about the fire hazard aspect of his flat roof design. To begin with, Robertson Q-Deck is designed with tight side and end laps to eliminate the need for an inflammable vapor seal. Its two-foot width and long span characteristics mean fewer joints, and its zinc-coated surface (or basic Galbestos) eliminates the need for field painting.



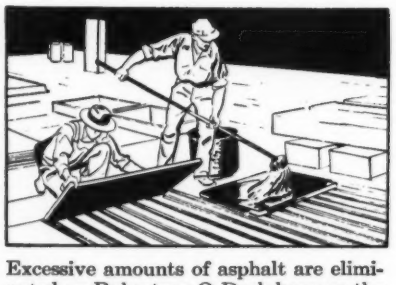
Robertson Q-Deck side laps are designed to form a standing seam. A seal in the form of a continuous caulking material assures a vapor-tight joint.



A special Robertson clamping tool mechanically fastens the side laps together, forming a steel fire barrier that remains intact as long as the structural supports are in place.



Ends of Robertson Q-Deck are sized and countersunk to produce a tight, smooth, two-inch lap joint. This lap, along with the tight side laps, provides a vapor-sealed roof construction.



Excessive amounts of asphalt are eliminated on Robertson Q-Deck because the adhesive is applied to the *insulation . . . not to the steel deck.* This also results in a better bond between the steel and the insulation.

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BOOKLETS —*Starts on page 90*

switch is suited for. Technical data and application aids are included. *Micro Switch, Div. of Minneapolis-Honeywell Regulator Co., Dept. CE, Freeport, Ill.*

COATING AND ADHESIVE products for use in installation and surface protection of industrial insulations are described in this company's revised Reference Manual. Designed as a companion to the Specifications book, it contains technical data and recommended uses. *Benjamin Foster Co., Dept. CE, 4639 W. Gerard Ave., Philadelphia 31, Pa.*

INFORMATION KIT gives complete information on the Apeco Systematic Auto-Stat for photocopying letters, reports, contracts, and other important records. How it cuts cost 80 percent by eliminating re-typing and checking is explained. Advantages such as turning out dry copies in 45 sec, and ease of operation are described. Kit includes folders on copying tax returns, color copying, and copying preprinted forms. *American Photocopy Equipment Co., Dept. CE, 1960 W. Peterson, Chicago 26, Ill.*

BURNER—Newly designed automatic burner, model PK-54, for oil, gas, and oil or gas, is described in four-page folder 430. Safety features are listed and the unit's integrated design is explained. For capacities to 42,000 lb steam per hour, the burner is described as a complete, automatic combustion unit including burner, blower, and controls. *Peabody Engineering Corp., Dept. CE, 580 Fifth Ave., N. Y. 36, N. Y.*

"NEW HORIZONS For Product Improvement," 16-pages, traces the history of light metals technology—surveys the use of aluminum and magnesium in present day design—and presents an objective appraisal of possible range of application of light metals for the future. One section is wholly devoted to fiberglas laminations; how they are molded, and important factors in their design. Methods of forming the metals are discussed in detail, with particular stress placed on the sand and permanent mold casting processes. *Rolle Manufacturing Co., Dept. CE, 301 Cannon Ave., Lansdale, Pa.*

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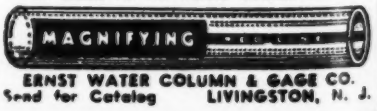

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consulting engineers' calendar

Date	Sponsor	Event	Location
Mar. 24-26	Illinois Institute of Tech.	American Power Conference	Hotel Sherman Chicago, Ill.
April 15-19	American Institute of Electrical Engineers	Southern Textile Conference	Georgia Tech. Atlanta, Ga.
Apr. 21-23	American Institute of Electrical Engineers	Conf. on Feedback Control	Hotel Claridge Atlantic City, N. J.
April 26-30	American Society of Tool Engineers	Industrial Exposition	Convention Center Philadelphia, Pa.
April 27	Association of Consulting Chemist and Chemical Engineers	Symposium-Banquet	Hotel Belmont Plaza New York, N. Y.
May 4-7	American Welding Society	Spring Meeting	Hotel Statler Buffalo, N. Y.
May 5-7	American Welding Society	2nd Welding Show	Memorial Audit. Buffalo, N.Y.
May 10-12	Compressed Air and Gas Institute	Spring Meeting	The Homestead Hot Springs, Va.
May 16-19	American Institute of Chemical Engineers	Summer Meeting	Springfield, Mass.
May 17-20	Basic Materials Exposition and Conference	2nd Annual Exposition	Amphitheater Chicago, Ill.
May 23-28	American Water Works Association	National Convention	Seattle, Wash.
June 14-19	American Society of Civil Engineers	Convention	Chalfonte-Haddon Hall, Atlantic City
June 20-24	American Society of Mechanical Engineers	Semi-annual Meeting	William Penn Hotel Pittsburgh, Pa.
June 20-25	American Institute of Chemical Engineers	Nuclear Engr. Conference	University of Mich. Ann Arbor, Mich.
June 21-25	American Institute of Electrical Engineers	Summer General Meeting	Los Angeles, Calif.
June 28-30	American Society of Heating and Ventilating Engineers	Semi-annual Meeting	New Ocean House Swampscott, Mass.
July 13-15	Western Plant Maintenance Show	Conference and Exposition	Pan Pacific Bldg. Los Angeles, Calif.
Sept. 15-17	Compressed Air & Gas Institute	Meeting	Skytop Lodge Skytop, Pa.

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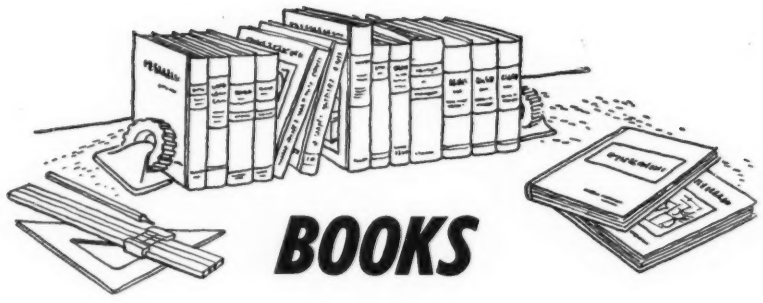

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BUSINESS, LEGAL, AND ETHICAL PHASES OF ENGINEERING, (Second Edition) by D. T. Canfield and J. H. Bowman; McGraw-Hill Book Company; 365 pages, 1954, $6.00

Reviewed by Alois W. Graf
Attorney at Law, Patent Causes

This is a second edition of a book designed to assist the student in the transition from the predominantly theoretical classroom to the field where practical solutions often have more than one definite answer. The wrapper on the book mentions various changes over the first edition, the principal ones being the addition of two chapters, "Business Organizations" and "Stocks, Bonds, and Notes," plus a rewriting of chapters on accounting and patents.

In general, the book presents a valuable perspective to the student or to the engineer who has been engaging in the practice of engineering for only a short time. Even for the more experienced engineer, the book might be valuable to re-establish a perspective.

The book frequently points out that it is not possible to completely cover the various subjects which are given consideration. Nevertheless there are many places which could be improved. There is undue emphasis on the advantages of a corporation over its disadvantages, thus tending to conclude that the corporate firm is always to be preferred over a partnership. However, the tax advantages of partnerships are not mentioned, nor is there any suggestion of the advantages of a limited partnership.

The chapter on patents has been practically rewritten, and yet there is much to be desired. There is a statement to the effect that the total cost of securing a valuable patent upon a rather involved circuit or device may prove to be several times the fee charged by the U. S. Patent Office. This reviewer is not aware of any worthwhile patent on even a simple device that was obtained at a price of only several times the fee charged by the U. S. Patent Office (which for some time has been a total of $60.00). This chapter quotes Section 4888 of the Revised Statutes of the United States, but this has been superseded by the Patent Act of July 19, 1952, Title 35, United States Code. This Act was public knowledge nearly 18 months prior to the publication of this book.

The title would lead one to believe that the ethical phases of engineering are a substantial portion of the book. Actually only 15 pages are devoted to this, of which 11 pages are a reprint of "The Second Mile" by W. E. Wickendon. The remaining four pages are inadequate and give an erroneous impression.

The authors advocate organization of engineers by membership in one of the Founder Societies. They seem to be entirely unaware of the engineering profession's growth and the high standards of the many technical engineering societies not identified as "Founder" Societies.

It is stated that it would require too much space to reproduce all of the codes of ethics of the Founder Societies. The authors should have made reference to the uniform code of ethics which has been adopted by more than 60 eminent engineering societies. Furthermore, there is no suggestion given to join a professional society as well as a technical society. No mention is made of the increasing use of national certificates of registration obtainable from the National Council of State Boards of Engineering Examiners.

The chapter on engineering as a profession does not list any refer-

ences, whereas practically every other chapter provides references or a bibliography. It is these references which are the saving grace for any other shortcomings which might be apparent in the book.

In spite of these rather critical comments, which have been made because this is a second edition of the book, the authors are to be commended for having presented a book that fills a definite need for both the student engineer and the young engineer in practice.

STEEL RIGID FRAME MANUAL, by Martin P. Korn; J. W. Edwards, Publisher Inc; 181 pages, 1953, $4.50

Reviewed by L. C. Maugh
Professor of Civil Engineering
University of Michigan

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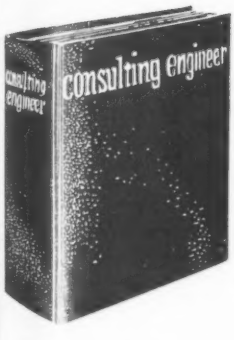

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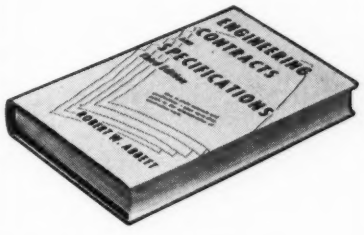

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